Through PB website

PRASAR BHARTI
(India's Public Service Broadcaster)
Directorate general of Doordarshan
Doordarshan Bhawan, Copernicus Marg
New Delhi -110001.

File No. 19(2)2023-24EI(P)TVDraftspecifications Dated :07-07-2025

Subject: **Technical Specification alongwith Suggestive Block Diagram and Suggestive Bill of Material (BOM) for SITC of Disaster Recovery Centre for DD FreeDish Platform at Old Akashvani Complex, LB Nagar, Hyderabad.**

Ref: 1. DG: DD letter dated 30/05/2025 (Copy enclosed).
2. Specification no: SATD/DD FreeDish DR Centre/May 2025 Dated 15/05/2025 (Copy enclosed).

With reference to DG: DD letter dated 30/05/2025, the Due Date to offer Comments is hereby extended up to **22.07.2025 17:00** hrs. Industry feedback with Budgetary Quotes for above mentioned Technical Specification may be offered by the prospective bidders on or before due date at e-mail ddpurchase401@yahoo.co.in or on following Address:

Assistant Engineer
Room No. 403,
Directorate General: Doordarshan,
Doordarshan Bhawan, Copernicus Marg,
New Delhi -110001 (India)
Telephone: 011- 2311 4401

This issue with the approval of competent authority.

Encl.: As above (206 Pages)

Digitally signed by
Narendra Kumar Chaurasia
Date: 07-07-2025 13:59:45

Assistant Director (Engg)
For DG:DD

Through PB website

PRASAR BHARTI
(India's Public Service Broadcaster)
Directorate general of Doordarshan
Doordarshan Bhawan, Copernicus Marg
New Delhi -110001.

File No. 19(2)2023-24EI(P)TVDraftspecifications Dated :30-05-2025

Subject: **Industry feedback for SITC of Disaster Recovery Centre for DD FreeDish Platform at Hyderabad.**

The Draft Technical specifications (Specification no: SATD/DD FreeDish DR Centre/May 2025 Dated 15/05/2025), Suggestive Block Diagram and Suggestive Bill of Material towards the upcoming tender is enclosed herewith to offer comments/Industry Feedback and Budgetary quotes by prospective bidders/Firms by due date at e-mail ddpurchase401@yahoo.co.in or on following Address:

Assistant Director (E)
Room No. 403,
Directorate General: Doordarshan,
Doordarshan Bhawan, Copernicus Marg,
New Delhi -110001 (India)
Telephone: 011- 2311 4401

Due Date to offer Comments: **13.06.2025 at 18.00 hrs.**

Encl.: As above (205 Pages).

Digitally signed by
Narendra Kumar Chaurasia
Date: 30-05-2025 11:39:36

Assistant Director (E)
For DG:DD

Prasar Bharati
(India's Public Service Broadcaster)
DIRECTORATE GENERAL: DOORDARSHAN

FOR INDUSTRIAL FEEDBACK

TECHNICAL SPECIFICATIONS
FOR
SITC OF DISASTER RECOVERY CENTER FOR
DD FREEDISH PLATFORM
AT
OLD AKASHVANI COMPLEX, LB NAGAR, HYDERABAD

Specification No.: SATD/DD FreeDish DR Centre/May 2025

Dated: 15/05/2025

TECHNICAL SPECIFICATIONS FOR
SITC OF DISASTER RECOVERY CENTER FOR
DD FREEDISH PLATFORM AT OLD AKASHVANI COMPLEX, LB NAGAR, HYDERABAD

INDEX

1. Introduction

This project envisages for SITC of Disaster Recovery Centre of Doordarshan's present "DD Free Dish Platform" at LB Nagar site, Hyderabad. Presently, DD FreeDish Platform at Todapur (Main Site) is up-linking 94 TV channels & 40 Radio channels in MPEG-2, DVB-S standard in free to air mode by using 5 transponders and 90 TV channels & 24 Radio channels in MPEG-4, DVB-S2 standard in free to air mode by using three transponder.

DD FreeDish DR Centre is proposed to have a provision of Input and Base Band System, Compression system, IF & RF system, Uplink & Downlink Antenna System, Monitoring System, Measuring System, Air-condition and Power Supply System. It is also envisaged to have provision for HDTV channels in the proposed compression system which shall be used alternatively in place of the SDTV channels. Inclusion of each HDTV channel in H.265/HEVC will result in a loss of few SDTV channels.

1.1 Proposed Plan of the Disaster Recovery Project:

A. Digital Compression Configuration (Encoders, IP Encapsulater / Mux and NMS)

	Proposed System				
	Configuration of TV & Radio Encoder Chassis		DVB-CAS	Digital Compression Standard	Uplink Standard
1	(X+2) SDTV & HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
2	(X+2) SDTV& HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
3	(X+2) SDTV & HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
4	(X+2) SDTV& HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
5	(X+2) SDTV& HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
6	(X+2) SDTV& HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
7	(X+2) SDTV& HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2
8	(X+2) SDTV& HDTV	8 Radio Channel	Yes	i) SD-MPEG-2 & MPEG-4 ii) HD-MPEG-4 & HEVC	DVB-S & DVB-S2

Note: X= No. of Encoder chassis required as per technical specification of Compression system for SDTV & HDTV channels and Radio Channel.

All the offered equipment shall be Conditional Access System (CAS-Generic) compliant for encryption & decryption of all services. Services like DVB-CSA (V-1 & V-2) supported DVB-CAS with simulcrypt encryption, Subtitling , Audio descriptor, EPG, closed captioning etc will be carried by the DD FreeDish platform and the equipment offered for DR Centre by the bidder shall be capable of carrying these services without any limitation or requiring

15/5/25 15/5/2025

upgradation by way of hardware and software. The offered Compression System shall also be Video on Demand (VoD) & NVoD with .TS format compliant, however Storage server, Play out system, GSM or IP based network for return path are not in the scope of this tender.

B. IF, RF and Uplink Antenna System (Modulator, Upconverter/Block Converter, HPA, RF Uplink PDA System, RF NMS)

Transponder No.	Proposed System				
	Configuration of Satellite Modulator & Block converter		**Configuration of HPA**	**Uplink Antenna System**	**Remarks**
1	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter	HPA SYSTEM* (With supplemental power/ redundant chassis)	9.0 to 9.4 mtr. RF Uplink Parabolic Dish Antenna System	To be uplinked in Horizontal Pole of Uplink Antenna No. 1
2	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter			
4	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter			
8	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter	HPA SYSTEM* (With supplemental power/ redundant chassis)		To be uplinked in Vertical Pole of Uplink Antenna No. 1
3	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter	HPA SYSTEM* (With supplemental power/ redundant chassis	9.0 to 9.4 mtr. RF Uplink Parabolic Dish Antenna System	To be uplinked in Horizontal Pole of Uplink Antenna No. 2
5	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter			
6	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter			
7	(1+1) DVB-S & S-2 compliant Satellite Modulator	(1+1) L band to Ku band Converter			

15/05/25

15/5/2025

* Note :- HPA SYSTEM shall have multiple main HPA chassis, required to give rated RF output power to get the required Rain Fade Margin & Link Margin, along with integrated supplemental power/redundant chassis (similar to Main HPA chassis), so that on failure of 25% (in equal or next whole numbers) of main chassis, HPA SYSTEM shall be able to provide rated RF output power to get the required Link Margin automatically with supplemental power/redundant chassis.

C. Air-condition and Power Supply System:

SITC of Air-condition System is required to be carried out in technical rooms like Input and Base Band System, Compression & Monitoring, UPS Room, HPAs area (Hall below Uplink PDAs) and RF NMS & Monitoring Room (Room Between both Uplink Antenna) etc to maintain minimum operating temperature for smooth operation and efficient utilization of all equipment.

SITC of Isolation Transformer, AVR & Uninterrupted Power Supply (UPS) system are required to be carried out for feeding regulated and uninterrupted power supply to the offered equipment for uninterrupted services of DD FreeDish Platform through DR Centre.

2 Scope of Work

The execution of SITC (Supply, Installation, Testing and Commissioning) is required as stated in "Invitation for Bid" and on the terms specified in the description of Technical Specification for SITC of Disaster Recovery Centre of Doordarshan's present "DD Free Dish Platform" at L B Nagar site Hyderabad; along with "Instruction to Bidder" at Appendix-A, "General Terms and Conditions" at Appendix-B, and Bid evaluation criteria at Appendix-C of the Bid document.

The scope of this project includes Supply, Installation, Testing and Commissioning (SITC) of setting up of geo-diversity earth station consisting of but not limited to the Input and Base Band System, Compression system, IF & RF system including RF NMS, Uplink & Downlink Antenna System, Monitoring System, Measuring System, SRT Gateway, Air-condition System, Power Supply System etc. The system shall be capable of seamless transmission of the Audio/Video of TV channel and Audio of Radio Channel to the Satellite and provide uninterrupted coverage to all DD FreeDish viewers in case failure due to any Disaster/rain/maintenance at main earth station at Todapur, Delhi. All equipment of these streams shall also be capable to take HDTV channel without any limitation or requiring any upgradation by way of hardware and software. These equipment will be used as an alternative to upgrade the SDTV channels to HDTV. Broadly the scope of the project consists of:

2.1.1 Bidder shall supply, install, test & commission (SITC) 18 sets of 4.5 to 4.8 mtr manually tracked motorized Receive PDA with C band Linear orthogonal Feed, 5G rejection BPF & LNBCs for receiving signal through Satellite.

2.1.2 Bidder shall supply, install, test & commission (SITC) 2 sets of 4.5 to 4.8 mtr Automatically tracked motorized Receive PDA and Antenna Control Unit with C band Linear orthogonal Feed, 5G rejection BPF & LNBCs for receiving signal through Satellite.

2.1.3 L band output signal of 10 nos. of Receive PDA (Main) shall be connected to L band Patch panel in compression room through L band cable and thereafter connected to Input of L band

Himanshu Goel 15/5/25

Router/Matrix which shall be a main Input signal/source; may be routed to IRDs through L band Router/Matrix.

2.1.4 Bidder shall supply, install, test and commission (SITC) L Band Optical Fiber Transmitter near Receive PDA and Optical Fiber Receive unit in Compression room which shall be connected through OFC Cable. Thereafter, L band output signal (Horizontal & Vertical pol) of 10 nos. of Receive PDA (Standby) will be connected to L band Optical Transmitters and L band output of Optical Fiber Receiver unit shall be connected to L band Patch panel and also from L band Patch panel to Input of L band Router/Matrix. The output of L band Router/Matrix shall be connected to L band IRDs, as and when required.

2.1.5 Bidder shall supply, install, test and commission (SITC) 1 set of L Band Router including minimum 64x320 L-Band Input & Output ports, X-Y/Router control panel with cable, dual redundant power supply (min.) and accessories.

2.1.6 Bidder shall supply, install, test and commission (SITC) 1 set of Work station with monitor, with cables and accessories for remote configuration, Monitoring and Control of L band Router.

2.1.7 Bidder shall supply, install, test and commission (SITC) 8 lots of IRDs for SDTV and HDTV channel. Each lot of IRDs shall be offered in (X+4) chassis configuration, if one professional IRD mounted in one Chassis. Whereas, each lot of IRDs shall be offered in (X+2) chassis configuration, if more than one professional IRDs mounted in one chassis. Here "X" is No. of Chassis required to mount/accommodate 28 Nos. Professional IRDs. Further, IRD racks shall be wired for 2 additional chassis of professional IRDs in each lot.

2.1.8 Bidder shall supply, install, test and commission (SITC) 8 lots of IRDs for Radio channel. Each lot of IRDs shall be offered in (Y+2) chassis configuration, if one professional IRD mounted in one Chassis. Whereas, each lot of IRDs shall be offered in (Y+1) chassis configuration, if more than one professional IRDs mounted in one chassis. Here "Y" is No. of Chassis required to mount/accommodate 8 Nos. Professional IRDs.

2.1.9 Bidder shall supply, install, test and commission (SITC) 8 sets of SD/HD-SDI Router which consist of minimum 64x64 HD-SDI Input & Output ports with X-Y remote control panel and single bus remote control panel. All 64x64 HD-SDI Input & Output ports shall also be capable to take SD-SDI signal without any limitation or upgradation/downgrading by way of hardware and software.

2.1.10 Bidder shall supply, install, test and commission (SITC) 8 sets of IP data switch in (1+1) configuration. Each set of IP data switch in (1+1) configuration shall be used for feeding IP input (Audio/Video Content) to the Encoders of one compression system.

2.1.11 Bidder shall supply, install, test and commission (SITC) 8 sets of compression system having H.264/MPEG-4 and H.265/HEVC compliant Encoders in (X+2) chassis configuration where "X" is no. of chassis comprising of atleast 16 HDTV Encoders with SDI input per stream. "X" no. of these encoder chassis shall also be capable to take atleast 40 SDTV signal with SDI input and compress them to MPEG-2 and H.264/MPEG-4 compression format without any limitation or requiring upgradation /downgrading by way of hardware and software.

Further, all the above encoder chassis of compression system shall also be capable to take MPEG-2 TS over IP input with decoding of MPEG-2, H.264/MPEG-4-AVC and H.265/HEVC Main 10 compressed contents to baseband signal format. Each encoder chassis with MPEG-2 TS over IP input shall be capable to encode minimum 4 HDTV channel in

15/05/25

H.264/MPEG-4-AVC & H.265/HEVC Main 10 (at a time anyone standard) and minimum 16 SDTV channel in MPEG-2 & H.264/MPEG-4 (at a time anyone standard) as tabulated in technical specification without any limitation or requiring upgradation/downgrading by way of hardware and software. The encoding combination of SD & HD Channel is tabulated in encoder specification section.

2.1.12 Bidder shall supply, install, test and commission (SITC) 8 sets of IP data switch in (1+1) configuration. Each set of IP data switch in (1+1) configuration shall be used for feeding IP input (Audio/Video Content) to one set of (1+1) IP Encapsulator system.

2.1.13 Bidder shall supply, install, test and commission (SITC) 8 sets of IP Encapsulator in (1+1) configuration. Each set of (1+1) IP Encapsulator shall be used for transmission of one transport stream.

2.1.14 Bidder shall supply, install, test & commission (SITC) 8 sets of Compression Network Management System (NMS) either in (1+1) master and slave configuration or in cluster configuration with minimum 3 servers for high availability (HA) to control and monitor streams i.e. 1st, 2nd, 3rd, 4th, 5th , 6th, 7th and 8th streams. Normally, each set of Compression Network Management System (NMS) shall control and monitor all compression equipment (i.e. IRDs, SDI Router, Encoders, Multiplexers, ASI Router, IP Switches etc) of one transport stream.

2.1.15 Bidder shall supply, install, test & commission (SITC) 8 sets of 16 x 16 or better matrix ASI router with dual redundant power supply, X-Y remote panel and single Bus panel.

2.1.16 Bidder shall supply, install, test & commission (SITC) 1 set of EPG and PSI/SI Generator/Server in (1+1) configuration with hot swappable dual redundant power supply.

2.1.17 Bidder shall supply, install, test & commission (SITC) 2 sets of IP Router with hot swappable dual redundant Power supply.

2.1.18 Bidder shall supply, install, test & commission (SITC) 2 sets of Firewall System in HA (High Availability) configuration with hot swappable dual redundant Power supply unit. Bidder shall also supply, install, test & commission (SITC) 2 sets of Administration & Management System of Firewall in HA (High Availability) configuration with hot swappable dual redundant Power supply unit.

2.1.19 Bidder shall supply, install, test and commission (SITC) 1 set of IP data switch in (1+1) configuration. IP data switch in (1+1) configuration shall be connected to IP Router and used for IP streaming (Audio/Video Content, Data) for broadcast.

2.1.20 Bidder shall supply, install, test & commission (SITC) 2x1 sets of NTP server with hot swappable dual redundant power supply.

2.1.21 Bidder shall supply, install, test and commission (SITC) Bi-directional Gateway System in 2x(1+1) configuration to Send & Receive eight transport stream between DD FreeDish (DRC) Hyderabad and DD FreeDish (Main) Todapur Delhi. The bidders may visit both site for their assessment of existing facilities and requirement before submission of the bid. Bidders desiring to visit the sites must submit the request to Doordarshan in one week advance with the details of the persons for facilitating the visit.

15/5/25

2.1.22 Bidder shall supply, install, test & commission (SITC) 8 sets of (1+1) redundant mode of satellite modulators and IF redundancy switches for managing redundancy of (1+ 1) satellite modulators.

2.1.23 Bidder shall supply, install, test & commission (SITC) 8 sets of IF to L Band Up-converter in (1+1) configuration and RF Redundancy switches (Internal or External) for managing redundancy of (1+ 1) L- Band Up-converters.

2.1.24 Bidder shall supply, install, test & commission (SITC) two sets of Ku band RF system to uplink four Carrier of 36 MHz Bandwidth with each set.

2.1.25 Bidder shall supply, install, test & commission (SITC) one set of Ku band RF system to uplink one Carrier of 36 MHz Bandwidth.

2.1.26 Bidder shall supply, install, test and commission (SITC) of one set of RF Equipment Control and Management System in (1+1) configuration with switching & interlock facility (RF NMS) for RF Equipment of all Transport streams at DD FreeDish (DRC) Hyderabad and SITC of one set of RF Equipment Control system with switching & interlock facility for RF Equipment of all Transport streams at DD FreeDish (Main) Todapur Delhi. Both systems shall be integrated as per site requirement.

RF network management system to be installed at DRC Hyderabad shall be integrated with existing RF system at DD Freedish Platform Todapur and capable to monitor and do smooth switching of all eight RF Carriers (In any combination) between DD FreeDish (DRC) Hyderabad and DD FreeDish (Main) Todapur Delhi as and when required in auto as well as manual mode. RF NMS clients to be provided for both Operations, NOC from remote site with both full & controlled administrative rights to monitor, control and perform switching as required.

2.1.27 Bidder shall supply, install, test & commission (SITC) two sets of Ku band (9.0 to 9.4 mtr) uplink PDA system (Including wave guide, Antenna Controller Unit (ACU), Ku-band LNA system, Beacon Tracking receiver (BTR), Rigid, Flexible & Axis crossover waveguides (for both ports), Dehydrator etc).

2.1.28 Both Sets of Ku band (9.0 to 9.4 mtr) uplink PDA system will be installed on platform raised from tentatively 4 m from the ground. As the HPAs and related RF equipment are to be installed in the hall below PDA, the ceiling of the hall should be minimum 10 feet height.

2.1.29 Bidder shall cover the space between of Both PDA foundation by RCC and the ceiling of the covering should be minimum 10 feet height to accommodate the ancillary equipment of RF system/monitoring and control of RF system. The distance between PDA base centers should be tentatively 15 m.

2.1.30 Bidder shall supply, install, test & commission (SITC) one set of external three phase Delta to Star 300 KVA Isolation transformer in power supply room.

2.1.31 Bidder shall supply, install, test & commission (SITC) one set of three phase with Neutral, 300 KVA Automatic Voltage Regulator (AVR) in power supply room.

15/05/25

15/5/2025

2.1.32 Bidder shall supply, install, test & commission (SITC) 2x200KVA (min) 3 Ø UPS, both operating in (1+0) Independent but work in sync, parallel load sharing mode with minimum 15 minutes battery back- up for each UPS with internal isolation transformer of min. capacity 200 KVA at the output of each UPS in power supply room.

2.1.33 Bidder shall supply, install, test & commission (SITC) one set of Power Distribution Panel (PDP), Sub Distribution Boards (SDBs) fitted with industrial type MCCBs & MCBs in compression room & Monitoring Room, hall below uplink PDAs, etc for each source of power supply which caters the load of all equipment in the respective room. The output of both (1+0) UPS system shall be connected to above said PDPs.

2.1.34 Bidder shall supply, install, test & commission (SITC) Power Supply cables (Minimum 70 Sqmm, 4 core copper Multi strand) between output of UPS PDPs to above said PDPs/SDBs installed in compression & Monitoring Room, hall below uplink PDAs.

2.1.35 Bidder shall supply, install, test & commission (SITC) 1 set of 42 RU, 19",1000 mm (depth) equipment ventilated racks for installation of all offered equipment. The suggestive number of equipment racks is approx. 40, however may increase as per the solution offered. All the racks are to be provided with two sets of Mains Distribution Units (MDUs), each having, inbuilt with MDU or external, dual input, single phase automatic power transfer/static switch connected between two sources of power supply routed through physically isolated routes. Please refer DRG No. 21 & 22..

2.1.36 Bidder shall supply, install, test & commission (SITC) cable trays on top of all equipment racks and as per approved layout of all equipment, all inter connecting cables (Audio/video, RF, power supply , control , data, earthing, sensor cables etc) shall be laid on cable tray and routed from top of racks.

2.1.37 The bidder shall provide minimum 34 sets of earth pits for equipment and power supply system and 44 sets of earth pits for PDAs for this DD FREEDISH set up. Please refer DRG No. 26.

2.1.38 Bidder shall supply and install one set of measuring equipment as per BOM.

2.1.39 The bidder shall supply, install, test & commission (SITC) 1 set of 64x32 SD-SDI & HD-SDI/ASI compatible router with dual redundant power supply, X-Y remote panel and single Bus panel for confidence level monitoring.

2.1.40 The bidder shall supply, install, test & commission (SITC) 1 set of confidence level monitoring system.

2.1.41 The bidder shall supply, install, test & commission (SITC) 16 sets of multi-viewer display system (For monitoring of Input TV source, Ku band DD FREEDISH Downlink signal). Each set of Multi Viewer display system shall display minimum 40 SDTV channels including 16 HDTV channels and 8 Radio Channel.

2.1.42 The bidder shall supply, install, test & commission (SITC) one Set of multi-viewer display system (For monitoring of one TV channel of each stream of Ku band downlink DD FREEDISH signal). Multi Viewer display system shall display minimum 16 SDTV channels including 8 HDTV channels and 8 Radio Channel.

2.1.43 The bidder shall supply, install, test & commission (SITC) 18 Nos., 55 inches (nominal) (diagonal) new LCD monitor with back-lit LED Based display system for monitoring of input TV & Radio sources and Ku band DD FREEDISH downlink signal in Monitoring Room , Compression Room and RF Monitoring Room .

2.1.44 Bidder shall provide Control & operators table made of powder coated MS sheet or aluminium to install remote operations & control computer, Remote Control panels, 17" Monitor, monitoring panel with Amplispeaker, measuring Equipment panel and other relevant equipment etc.

2.1.45 The bidder shall supply, install, test & commission (SITC) High Cooling Packaged type air-cooled air conditioners with outdoor (condensing unit)

2.1.46 Bidder shall provide Temperature and Humidity Monitoring system.

3 Work Experience for Vendor/Bidder and OEM (Original Equipment Manufacturer)

3.1 Work Experience for Selection of the vendor:-

3.1.1 Bidder must have his local office/authorized representative/dealer in India for after sales service support.

3.1.2 The Bidder shall have to meet the following Work experience:-

Work Experience- (Self - certified with relevant documents*)-	a. One Similar work** of minimum value of 80% of estimated cost of the project. or b. Two Similar works** of minimum value of 60% of the estimated cost of project. or c. Three Similar works** of minimum value of 40% of the estimated cost of project.

Note:

a) **Self-certified with Relevant document* means to provide copies of work order/orders clearly mentioning the cost of the project/projects and Receipt Certificate/successful completion certificate/Factory dispatch document/Delivery Challan/Copy of Invoice of the project/projects to various organizations along with the bid.

b) ***Similar works will be defined based on scope of the work* or SITC of Earth Station/Teleport for DTH/DD FreeDish/Digital Earth Station/DTT/DVB-C/VSAT/DSNG/IT Based Broadcasting Equipment (i.e. as a standalone or in combination of these works) in any past five financial years during the period 2018-19 to 2024-25. Similar Work may be executed with any Central and State Government agency, PSUs, Private organizations. Bidder shall provide list of all the self-certified relevant document of such work experience along with their cost in Rupees as per Annexure - VI of Appendix D.

3.2 Work Experience for OEM of Input and Baseband System:-

3.2.1.1 Bidder shall offer L band Router/Matrix of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar L band Router. List of past supply record of OEM of such equipment to various organizations must be provided.

3.2.1.2 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in any past five financial years during the period 2018-19 to 2024-25.:

S. No.	Offered Equipment	Qty
1	L band Router/Matrix	5 Nos.

3.2.1.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of L band Router/Matrix provided in

Himanshu Goel 15/5/25

para 3.2.1.2 to various organizations in any past five financial years during the period 2018-19 to 2024-25 should essentially be submitted along with the bid document.

3.3 Work Experience for OEM of Compression System:-

3.3.1.1 Bidder shall offer compression system of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar compression equipment. List of past supply record of OEM of such equipment to various organizations must be provided.

3.3.1.2

a) OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in any past five financial years during the period 2018-19 to 2024-25.

S. No.	Offered Equipment	Quantity
1	Professional IRDs	100 Nos.
2	IP Encapsulator	10 Nos.

b) OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in post year 2021.

S. No.	Offered Equipment	Quantity
1	Encoder Chassis*	12 Nos.

*Out of 12 Nos of Encoder chassis, atleast 6 nos. of Encoder chassis should have been supplied for DTH /Earth Station compression system for Broadcast Purpose.

3.3.1.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice in respect of above said quantity of professional IRDs and IP Encapsulators provided in para 3.3.1.2 (a) in any past five financial years during the period 2018-19 to 2024-25; and in respect of above said quantity of Encoders Chassis provided in para 3.3.1.2 (b) in post year 2021 to various organizations should essentially be submitted along with the bid document.

3.4 Work Experience for OEM of IF & RF System (Satellite Modulator, L band Upconverter, Down Converter, High Power Amplifier):-

3.4.1.1 Bidder shall offer RF system of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar RF System. List of past supply record of OEM of such equipment to various organizations must be provided.

3.4.1.2 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in any past five financial years during the period 2018-19 to 2024-25:

S. No.	Offered Equipment	Quantity
1	Satellite Modulator	10 Nos.

15/05/25

15/5/2025

2	L Band Upconverter	10 Nos
3	L band Down Converter	10 Nos.
4	High Power Amplifier (TWT or SSPA) (i.e. as per Offered Amplifier)	10 Nos

3.4.1.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of equipment provided in para 3.4.1.1 to various organizations in any past five financial years during the period 2018-19 to 2024-25 should essentially be submitted along with the bid document.

3.5 Work Experience for OEM of Uplink and Receive PDA System:-

3.5.1.1 Bidder shall offer Parabolic Dish Antenna of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar Uplink/Receive Antenna. List of past supply record of OEM of such equipment to various organizations must be provided.

3.5.1.2 OEM of the offered Parabolic Dish Antenna must have manufactured and supplied the offered or higher size Parabolic Dish Antenna to the leading broadcaster as mentioned in the table below in any past five financial years during the period 2018-19 to 2024-25:

S. No.	Offered Equipment	Quantity
1	Uplink Parabolic Dish Antenna (PDA)* (*Tx & Rx type operating in Ku band or Higher Frequency)	10 Nos. # (# Out of 10 nos. of Uplink Parabolic Dish Antenna (PDA), the size of atleast 3 no. of PDA should be of same size as offered Uplink PDA and the size of remaining Uplink PDAs should be of offered size and/or higher size)
2	Parabolic Dish Antenna (PDA)** (**Receive Only and or Tx & Rx type operating in C band or Higher Frequency)	10 Nos. ## (## Out of 10 nos. of Parabolic (PDA), the size of atleast 3 no. of PDA should be of same size as offered PDA and the size of remaining PDAs should be of offered size and/or higher size)

3.5.1.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of Parabolic Dish Antenna (PDA) provided in para 3.5.1.2 to various organizations in any past five financial years during the period 2018-19 to 2024-25 should essentially be submitted along with the bid document.

3.6 Work Experience for OEM of Monitoring System:-

3.6.1.1 Bidder shall offer Multi-viewer of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar Multi-viewer. List

of past supply record of OEM of such equipment to various organizations must be provided.

3.6.1.2 OEM of the offered equipment must have manufactured and supplied the offered or higher capacity Multi-viewer to the leading broadcaster as mentioned in the table below in any past five financial years during the period 2018-19 to 2024-25:

S. No.	Offered Equipment	Quantity
1	Multi-viewer	10 Nos.

3.6.1.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of Multi Viewer provided in para 3.7.1.2 to various organizations in any past five financial years during the period 2018-19 to 2024-25 should essentially be submitted along with the bid document.

3.7 Work Experience for OEM of UPS System:-

3.7.1.1 Bidder shall offer UPS of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar UPS System. List of past supply record of OEM of such equipment to various organizations must be provided.

3.7.1.2 OEM of the offered equipment must have manufactured and supplied the offered or higher capacity UPS System to the leading broadcaster as mentioned in the table below in any past five financial years during the period 2018-19 to 2024-25:

S. No.	Offered Equipment	Quantity
1	UPS System	10 Nos.

3.7.1.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of UPS system provided in para 3.7.1.2 to various organizations in any past five financial years during the period 2018-19 to 2024-25 should essentially be submitted along with the bid document.

3.8 Bidder must have a valid Dealer Possession License (DPL) at the time of submission of bid. A copy of valid DPL should be submitted along with bid.

3.9 In addition to above said work experience of the Vender and OEM, Vender/bidder shall also see and ensure to meet the commercial and Financial eligibility criteria pertaining to the a) company existence, b) Annual turnover/Net worth, c) Positive net worth/Profitability, d) Non-Blacklisting certificate, e) ISO certification (If required), f) GFR restrictions/Norms (if required), g) PMA and h) relaxation for Start-up as mentioned in the Appendix A, Appendix B & Appendix C of the bid document.

3.10 For Consortium/Joint Venture (If applicable):

In case of Consortium/Joint Venture, Vender/bidder shall follow the instructions provided at Appendix-A of the bid document.

4. Turnkey Implementation and Commissioning:-

a) The complete project will consist of Supply, Installation, Testing and Commissioning (SITC) of Disaster Recovery Centre of Doordarshan's present "DD FreeDish Platform" at L B Nagar Hyderabad. The project will be carried out on turnkey basis.

b) Each and every offered equipment and accessories including software should be from reputed manufacturer and the quoted model should be high class, high MTBF, field proven and in use by leading broadcasters/ organizations.

c) The system shall be designed to meet the international standards for digital satellite broadcasting known as the 4:2:0, MPEG-2, MP@ML & H.264/MPEG-4, MP@L3 for SDTV and 4:2:0, H.264/MPEG-4, MP@L4 & H.265/HEVC, MP@L4 for HDTV standards.

d) The bidder has to comply with BIS (Bureau of Indian Standard) certification on invoke to all the offered equipment.

4.1 Input and Base Band System:

4.1.1 Bidder shall lay, integrate and test L band cable, OFC Cable with matching connectors as per scope of work from Receive PDA to L Band Router/Matrix and L band Router /Matrix to IRDs as per DRG 1, 2, 3, 5, 6, 7, 8, 9 & 10.

4.2 Compression System:

4.2.1 Bidder shall lay, integrate and test video cables with matching connectors from all IRDs of TV Channel to SD/HD-SDI Input patch panels, SD/HD-SDI Input Patch Panels to SD/HD SDI Routers, Output of SD/HD SDI Routers to Output Patch Panels and finally upto the input of all Encoder chassis.

4.2.2 Bidder shall lay, integrate and test Audio cables with matching connectors from all Radio channel IRDs to the Input of AES patch panels, AES Patch Panels to AES Audio/Video Embedder; Video cables from AES Audio Embedder to SD/HD-SDI Input patch panels, SD/HD-SDI Input Patch Panels to SD/HD SDI Routers, Output of SD/HD SDI Routers to Output Patch Panels and finally upto the input of all Encoder chassis.

4.2.3 Professional IRDs for Receiving TV Channels and Radio channels shall have same technical specification and shall meet DD Technical specification. The quantity of the chassis for professional IRDs may vary in the suggestive DRG No. 5, 6, 7, 8, 9 & 10 as per offered solution by the successful bidder.

4.2.4 Bidder shall lay, integrate and test Ethernet cables with matching connectors from IRDs to (1+1) IP data switch & network switch and upto the input of all Encoder chassis of each compression system. Further, Ethernet cables with matching connectors shall also be laid, integrate and test from the output of Encoder chassis to (1+1) IP data switch and upto the input of (1+1) IP Encapsulator of each sets.

4.2.5 There shall be two fully populated complete chassis of encoder as redundant for each stream. The number of encoders in the redundant chassis shall be populated with same or more number of encoders as in highest populated main encoder chassis.

4.2.6 Bidder shall lay, integrate and test Ethernet cables with matching connectors from IP Router to EPG and PSI/SI Generator/Server and upto the IP data switches & network switches.

4.2.7 Bidder shall lay, integrate and test RF cables with matching connectors from GPS Antenna to NTP Time server and Ethernet cables from NTP server to IP network switches.

4.2.8 All the Electronic equipment should have necessary control interfaces through RS 232 / RS 422/ RS 485/ RJ45 etc, so that they can be interfaced with a Control Computer for remote monitoring and control with suitable GUI. The associated software for logging, archiving, monitoring and controlling along with the accessories should also be made available.

4.2.9 For Integration of equipment, Indoor type Video Cable, Audio Cable, and CAT-6 or better cable for Audio/Video/IP data, IP networking should be used.

4.2.10 The system must offer an intuitive user interface as well as remote configuration of all modules, simplifying system deployment and reducing operational routines.

4.3 Digital Satellite Modulator System:-

4.3.1 Bidder shall install, integrate, test and Commission Satellite Modulator System with IF Redundancy Switch for all Uplink carriers.

4.4 RF system (L band Upconverter & HPA) and Uplink PDA System:-

4.4.1 Bidder shall install, integrate, test and Commission L band upconverter & HPA system with BUC to uplink 8 Carrier of 36 MHz Bandwidth with two uplink Antenna system (3 carrier in Horizontal Port & One Carrier in Vertical Port Antenna No. 1; and 4 carrier in Horizontal Port of Antenna No. 2).

4.4.2 Bidder shall lay, integrate, test and Commission Uplink Antenna System to uplink Ku band Carriers of DD FreeDish Platform. Both Sets of Ku band (9.0 to 9.4 mtr) uplink PDA system will be installed on platform raised from tentatively 4 m from the ground. As the HPAs and related RF equipment are to be installed below PDA, the ceiling of the hall should be minimum 10 feet height. Bidder shall cover the space between of Both PDA foundation by RCC and the ceiling of the covering should be minimum 10 feet height to accommodate the ancillary equipment of RF system/monitoring and control of RF system below that space. The distance between PDA base centers should be tentatively 15 m. Please refer DRG No. No 17

4.4.3 Bidder shall lay, Integrate and test RF system and Uplink Antenna System with high power rigid waveguides.

4.4.4 Bidder shall supply, install Wave Guide support tray & cable tray between PDA and HPA (approximate length- 5 mtrs).

4.4.5 Cabling from monitoring port of all equipment such as Up-converter, HPA, Directional coupler and LNA up-to spectrum analyser will be provided through a patch panel near Spectrum Analyser.

4.4.6 One output of L band router need to be terminated up to Spectrum Analyser installed in Input base band rack.

4.5 Receive Parabolic Dish Antenna System:

4.5.1 Bidder shall supply, install, test and commission 18 nos. of 4.5 mtr to 4.8 mtr (size) manual tracking motorized receive PDA with two port C Band linear orthogonal feed.

4.5.2 Bidder shall supply, install, test and commission 2 nos. of 4.5 mtr to 4.8 mtr (size) Auto tracking motorized receive PDA and Antenna Control Unit with two port C Band linear orthogonal feed.

4.5.3 Bidder shall carry out Antenna foundation with provision of Earthing including Earthing pits and Lightning Arresters for the offered Receive Antenna System.

4.5.4 Bidder shall Supply and install Support poles & covered cable tray from Receive Parabolic Dish Antenna system to compression room (Min. distance-50 m) at site for laying of L band cables, OFC cables and power cables of newly supplied receive PDAs.

4.5.5 The Support poles & Cable tray with cover must be made up of galvanized iron material and should be painted with anti-rust, anti-corrosion paint.

4.5.6 L band cables of these receive Parabolic Dish Antenna will be brought to compression room and shall be terminated at the respective L band patch panel.

4.5.7 Power Supply cables of these receive Parabolic Dish Antenna will be brought from outdoor unit to Antenna SDB installed in Compression room/Power Supply room and shall be terminated to MCBs.

4.6 Monitoring and Measuring system

4.6.1 Bidder shall make provision for monitoring of Input/Source signals received from C - band receive PDA through IRDs i.e. IP Input (MPEG-2 TS over IP, RTMP, HLS, SRT) compressed in MPEG-2, MPEG-4 & HEVC format need to be routed to the input of multi-viewer. Dolby Digital (AC-3) 5.1 audio data with meta data are also embedded on to HD-SDI signal which shall be routed to multi viewer system for monitoring. In addition to above, Bidder shall also make provision for monitoring of Inputs/source signal of Radio service received from the output of AES Audio embedder i.e. carrying with SD/HD-SDI colour bar and routed to the input of Multi-viewer. (Please refer DRG No. 18, 19).

4.6.2 Bidder shall make provision for monitoring of DD FreeDish Downlink signals received from Ku- band receive PDAs need to be routed through chassis consisting of multiple DVB-S & DVB-S2 demodulators & CAS (Generic) descramblers with MPEG-2 TS over IP output and MPEG-2, MPEG-4 & HEVC SD and HD decoders and it shall be routed to the input of multi viewer of monitoring system. MPEG-1 Layer-II and Dolby Digital (AC-3) 5.1 audio data with meta data are also embedded on to HD-SDI signal which shall be routed to multi viewer

system for monitoring. (Please refer DRG No. 18, 19). There should be at least one chassis of demodulator & CAS (Generic) descramblers for each stream.

4.6.3 There should be CI slot in downlink chain to demodulate DVB-S & DVB-S2 services and descramble (CAS) all MPEG-2, MPEG-4 & HEVC services of all streams. There shall be provision to demodulate & descramble (CAS) at least 40 TV service & 8 Radio channel per stream. CI slot is required to be provided in the downlink monitoring chain for CAM modules in demodulators/Descrambler or before decoders so that encrypted channels can be received. Each CAM module shall decrypt upto eight services.

4.6.4 Bidder shall supply, install, test & commission (SITC) Sixteen sets of multi-viewer display system for monitoring of TV Channels (Eight sets for Input source and other Eight sets for Monitoring of Ku band DD FreeDish Downlink signal). Each set of multi viewer display system shall be provisioned to decode and display 40 SDTV including 16 HDTV channels and 8 Radio channels.

4.6.5 Bidder shall provide video cables connected between multi viewer systems to display system in Monitoring room.

4.6.6 Bidder shall supply, install, test & commission (SITC) 5 nos. of Ku- band receive Antenna having size 120 cm , 5 nos. of Ku band receive Antenna having size 90 cm and 5 nos. of Ku band receive Antenna having size 60 cm for receiving the downlink signal for DD FreeDish downlink monitoring.

4.6.7 Bidder shall supply install, test & commission (SITC) of 2 sets of Computer Control system for Multi-viewer monitoring system. One set shall be used for Input source multi viewer monitoring and other set for down link multi viewer monitoring system.

4.6.8 The bidder shall supply, install, test & commission (SITC) 1 set of 64x32 SD-SDI & HD-SDI/ASI routers with redundant power supply with X-Y remote panel and single Bus panel (Please refer DRG No. 18) for confidence monitoring setup.

4.6.9 Bidder shall supply, install, test & commission (SITC) 1 set of confidence level monitoring system including IRDs, 16.5 to 17 inch color monitor, Audio/Video Amplispeaker etc. There should be provision for monitoring points at the following locations:

a. **Input Monitoring(SDI)**: SDI (with Embedded audio in MPEG-1 Layer-II, Dolby Digital AC-3 5.1 Audio & Dolby Digital Plus 5.1 audio and metadata) from SDI Routers using 64x32 SD & HD-SDI/ASI Router, WFM, 16.5 to 17 inch colour monitor, 16 Channel Audio/Video Monitor with Amplispeaker (Refer DRG No. 5, 6, 7, 8 & 18).

b. **Input Monitoring (ASI & IP)**: ASI Output of source IRDs through patch panel and its IP output through IP Switch, IRD (with ASI & IP input) and 64x32 SD & HD-SDI/ASI Router, using WFM and 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker (Refer DRG No. 5, 6, 7, 8 & 18).

c. **Encoders Monitoring:** Output of encoder through IP Switch, IRD (with IP input) and 64x32 SD & HD-SDI/ASI Router, using WFM and 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker (Refer DRG No. 11, 12, 13, 14 & 18).

d. **Multiplexers monitoring:** Multiplexer output through ASI router and IRD (with ASI input) and 64x32 SD & HD-SDI/ASI Router, using WFM & 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker) (Refer DRG No. 11, 12, 13, 14 , 18 & 19).

e. **Satellite Modulator Monitoring:** Satellite Modulator output through IF to L band Upconverter and IRD (with L band input) and 64x32 SD & HD-SDI/ASI Router, using WFM & 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker) (Refer DRG No. 14, 15 & 18).

f. **L band Upconverter Monitoring: :** L band Upconverter output through IRD (with L band input) and 64x32 SD & HD-SDI/ASI Router, using WFM & 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker) (Refer DRG No. 16, 16 A & 18).

g. **HPA & Uplink Antenna Monitoring:** TLT output through IRD (with L band input) and 64x32 SD & HD-SDI/ASI Router, using WFM & 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker) (Refer DRG No. 16, 16A & 18).

h. **Ku band Downlink Monitoring:** Ku band (D/L Frequency) to L band Downconverter output through IRD (with L band input) and 64x32 SD & HD-SDI/ASI Router, using WFM & 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Amplispeaker) (Refer DRG No. 16, 16A & 18).

i. Temperature and humidity monitoring facility of each new equipment rack through remote computer.

4.7 UPS, Isolation Transformer, AVR , Mains Distribution Unit and Power Supply system:

4.7.1 Bidder shall supply, install, test & commission (SITC) Power Distribution Panel, Sub Distribution Boards (SDBs) fitted with MCCBs & MCBs in compression room, Monitoring Room and HPA Room for power supply which caters the load of all equipment in the respective room. Please refer DRG No. 20, 21 & 22.

4.7.2 Bidder shall supply, install, test & commission (SITC) Minimum two sets of Mains Distribution Units (MDUs), each having, inbuilt with MDU or external, dual input, single phase automatic power transfer/static switch in each rack for providing redundant power supply to equipment. Please refer DRG No. 21 & 22.

4.7.3 Bidder shall provide two separate sources of power supply in each rack through physically isolated routes and terminated on industrial type 3 Pin female connecter to be mounted near each rack. Further, both source of power supply shall be connected to dual input static switch inbuilt with MDU or dual input external single phase automatic power transfer/static switch through industrial type 3 Pin male connector. In case of external static switch, the outputs of single phase automatic power transfer/static switch shall be connected to MDU for further feeding to equipment. Please refer DRG No. 21 & 22.

4.7.4 Bidder shall supply, install, test & commission (SITC) Thermometers and Hygrometers with IP output in each rack for monitoring of temperature and humidity of each rack at monitoring room through remote monitoring system. Please refer DRG No. 25.

4.7.5 Bidder shall assess the electrical load of equipment installed in each room, required length & rating of power supply cables. Bidder shall provide assorted length of copper power supply cables with minimum 50 percent (nominal) load margin for interconnecting/integrating from UPS Output PDPs to individual rooms PDPs &SDBs etc. Please refer DRG No. 20, 21, 22 , 23 & 24..

4.7.6 The layout plan, electrical diagram, PDP layout, SDB layout, Rack layout, Interconnecting drawing of Equipment Drawing and other drawings need to be submitted for approval of Doordarshan before execution of SITC work at site.

4.7.7 The offer shall include supply, installation, testing and commissioning (SITC) of the setup, complete in all respects. A suggestive block schematic is provided to give a general idea about the intended configuration. A complete schematic of actually proposed implementation including power supply system should be supplied along with the quote.

4.8 System Requirements:

4.8.1 The bidder must ensure completeness of the envisaged DRC of DD FreeDish set up in all respects. The envisaged DRC of DD FreeDish set up should be completed and fully wired for all the equipment fitted in 19" standard racks. The offered system must have enough flexibility in adapting the changing requirements from the technical and operational point of view. The bidder should submit detailed schematics and layouts for proposed solution based on the offered equipment along with the offer.

4.8.2 In order to ensure the completeness of the scope of system, any additional equipment/accessories which bidder feels necessary to complete the configuration should also be quoted. However, in such case they should provide proper justification for the additional equipment required.

4.8.3 Bidder shall submit only one solution (Single BOM) for the offered system. Bid with multiple options against any requirement is liable to be rejected. BOM shall not contain any optional items as an alternative for any line entry item. However, bidder can offer additional accessory items as options for performance improvement of main line entry item of same make.

4.8.4 Each offer should be complete in all respect. Incomplete & non-compliant offers will be rejected summarily, without making any references to bidder.

4.8.5 Bidder may have to demonstrate the features of equipment offered as and when asked as part of technical evaluation of tender including statistical multiplexing in MPEG-4/HEVC compression format for 32 SDTV/16 HDTV channels in full resolution per transport stream. However, it will not bestow any right of acceptance of the bid.

4.8.6 In the process of technical evaluation, Doordarshan may ask for any clarification/ query as required through e-mail/FAX/Post, which shall be treated as a part of tender and invariably attended and replied by the bidder within the time stipulated therein.

4.8.7 Cross reference in respect of supporting documents, should be given with proper page number and volume no. etc. If required Doordarshan may also ask for any other supporting document to ascertain the claim of bidder and their OEM.

4.8.8 All software being offered, are to be licensed to Doordarshan on perpetual basis without specifying any time limit or without specifying any end of life of the software. Software upgrades within five years of installation i.e. warrantee period should be supplied free of cost.

4.8.9 The bidders may visit the site/sites for their assessment of existing facilities and requirement before submission of the bid. Bidders desiring to visit the site/sites must submit the request to Doordarshan in one week advance with the details of the persons for facilitating the visit.

15/05/25

4.8.10 Cost of any other work, consultancy and material required for completing the installation & commissioning of the Input Baseband System, Compression System, Satellite Modulator System, RF System, Uplink antenna System, Receive Antenna System and monitoring system including power supply system should be taken into account and clearly mentioned while submitting the tender.

4.8.11 The local office/authorized representative/dealer will be nodal point for resolving issues, related to installation, commissioning and after sales service support. Details of OEM office and its location are to be provided along with bid.

4.8.12 The offer should clearly specify the list of equipment hardware, interfaces, cables etc and associated software provided with the Remote Computer System for interfacing it with different components of the chain.

4.8.13 To avoid any delay due to inter-dependent activities like site readiness, providing power supply etc, The bidder should submit time frame for completing the activities up to the commissioning of the set-up on a PERT chart starting from date of issue of Purchase Order (P.O.) (i.e. DD/MM/YYYY)+ along with bid.

4.8.14 As an SITC contract, all supplied equipment are to be installed, tested and commissioned at site mentioned above, by the Bidder. The cost of any other interconnecting material and labour required for laying of cables, Earthing etc. should be included in the tender.

4.8.15 The successful bidder will be solely responsible for commissioning and operationalisation of the Input and Baseband System, Compression System, Satellite Modulator System, RF System, Uplink antenna System, Receive Antenna System, Monitoring System and Power Supply System to the satisfaction of Doordarshan.

4.8.16 System/equipment (motor controllers etc.) should be offered along with its frame/housing and other accessories which are necessary to meet the specifications/requirement and for the full exploitation of the equipment.

4.8.17 The routing of wiring between racks to be done from the Top of the racks.

4.8.18 The bidder should specify the hardware limitation if any.

4.8.19 The system must offer an intuitive user interface as well as remote configuration of all modules, simplifying system deployment and reducing operational routines.

4.8.20 A suggestive block schematic is provided in annexure –VII of Appendix-D (29 sheets) to explain the full scope of the work and give a general idea about the intended configuration. A complete schematic of actually proposed implementation should be supplied along with the quote. Physical topography may be different than the suggestive block diagram but it should meet the project objectives.

4.8.21 The layout plan of equipment of Input and Base band system, Compression system, Satellite Modulator System, RF System, Uplink antenna System, Receive Antenna System, Monitoring system, Power Supply System, racks, electrical diagram, PDP, SDB layout and other drawings need to be submitted for approval of Doordarshan before execution of SITC work at site.

4.8.22 The system offered should be complete in all respect.

5. Technical Specification of Major Equipment

5.1 Specification for Input and Base band System

L band output signal of 10 nos. of Receive PDA will be connected to suitable splitter (if required), Splitter to L band Router in compression room and finally L band signal shall be connected to all IRDs. The remaining 10 Nos Receive PDA will be connected to L Band Router through OFC Link in compression room. The major equipment of input and base band system will consist of:

(a) L band OFC Link

(b) 64x320 L Band Router

(c) IRD's for SD & HD TV and Radio channels

(d) AES Audio Digital & SDI Video Embedder

(e) 4.5 mtr to 4.8 mtr C band Receive PDAs

(f) Firewall System

5.1.1 L Band OFC Link

A) General

(i) The L-Band fiber optic Transmitter and Receiver pair will be used for transporting RF Satellite signals in the L Band over optical fiber from the optical transmitter panel near antenna to the L band router panel located in Compression room.

(ii) The offered solution should be scalable and modular in design and architecture. The offered system should have space for future expansion by adding additional optical transmitter and/or receiver modules.

(iii) Status of Trans & Receive unit shall be monitored locally / remotely.

(iv) The Optical Transmitter and Receiver Module should support monitoring/status of RF Power.

B) L-Band to Optical Fiber Transmitter:-

(a) Features:-

(i) Outdoor fiber optic transmitter for transmission of L–Band signal received from PDA. IP65 weatherproof, packaged in a compact, standalone enclosure. Suitable for mounting/ house in Outdoor Unit mounted on or near the satellite dish antenna structure.

(ii) L Band OFC Link, should have Outdoor Unit, Compact IP65 weather proof enclosure/Outdoor Unit which can house multiple Optic fiber transmitter modules, along with required accessories with mounting brackets to be conveniently mounted directly on or near the antenna structure.

(iii) Power supply unit shall have the capacity to feed min. six RF fiber optic transmitters located in outdoor (placed at 100m min. from the power supply Unit) including DC power for upstream LNBs. It should have dual, redundant power supplies and provides min. six outputs

. This power supply Units should be housed in Compact enclosure and will be kept in compression Room

(iv) It shall accept RF input in L band on coaxial cable and provide corresponding independent optical output for transmission.

(v) The units should provide DC pass through and 13/18V/OFF DC modes for LNB power along with Active LNB current limit & short circuit protection.

(vi) It should have 22kHz tone on/off for LNB local oscillator control.

(vii) It should have manually adjustable or AGC gain modes to manage RF level.

(viii) It should have comprehensive LED indicators on Transmitter module and/or LCD Display panel on chassis for status information like LNB voltage and DC input voltage level etc.

(ix) It should have Protocol independent design - transports all modulation formats.

(b) Technical parameter of Optical Fiber Transmitter (L band to optical fiber conversion):-

S. No.	Parameter	Specification
1	RF Input Connector	BNC/F-Type/N Type, Female, 75Ω (Suitable matching adopter may also accepted)
2	No of RF Input Port	Minimum one no.
3	Input Frequency Range	950 MHz to 2150 MHz
4	RF Input Level	-10 to -60 dBm
5	RF input power level (Damage Level)	+3dBm or better
6	Input return loss	10 dB or better
7	Link Gain Range	20 dB Min in 2 dB step or better
8	Switchable LNB-supply	**13V, 18V, OFF (Selectable) DC, 22kHz tone, 400mA min**
9	Protection	Short Circuit, Current Limited
10	Optical output connector	SC/LC APC, Female
11	No of OFC output port	Minimum 1 No.
12	Fibre Type	Single Mode
13	Operating wavelength	1310nm ±10nm
14	Optical output power	+2dBm or better
15	Compliance laser Safety	Class-1 laser product, compliance with IEC 60825-1 or better
16	Compliance EMI/RFI	Comply with FCC part 15,Class A EU EMC directive

C) Optical to L Band Receiver:-

(a) Features:-

(i) It shall accept optical input and provide corresponding independent L band output for transmission.

15/5/25

(ii) The fibre optic receivers should accepts a single fiber optic input on an SC/LC/APC connector and provide L band output signal. They should accept the fiber optic input from a compliant transmitter and provide the undistorted L band output signal.

(iii) It should be Protocol transparent receiver who can receive all video, audio and data modulation formats.

(iv) It should have built-in gain for optimal signal level tuning and supports manual, and automatic (AGC) gain control modes to provide L band output independent of optical loss.

(v) It should have comprehensive LED indicators on Receiver module and /or LCD display panel on chassis for status information.

(vi) Optical to L band receivers shall be installed in 19" rack-mounted frame having built-in 1:1 dual redundant hot swappable power supply units and configurable locally through front-panel or remotely via Web-Interface (Web-GUI, SNMP etc).

(b) Technical parameter of Optical Fiber Receiver (Optical to L Band conversion):-

S. No.	Parameter	Specification
1	Optical Input Connector:	SC/LC APC, Female
2	No of Input Connector	Minimum 1 No.
3	Fibre type	Single Mode
4	Operating Wavelength (Nominal)	1310 nm - 1550nm (Optimized with OFC Transmitters)
5	Optical Power sensitivity	0 dBm or better
6	Optical input power level (Damage Level)	+3dBm or better
7	RF output	Minimum 1 No.
8	RF output connector	BNC/ F-Type/N Type, Female, 75 Ohms (Suitable matching adopter may also accepted)
9	RF output Frequency range	950MHz to 2150 MHz
10	RF output	Better than -30dBm
11	Output return loss	12 dB or better
12	Frequency response OFC Link	±1.5dB max at -30dBm RF output
13	Link Gain range	20 dB (in 2 dB step or better) or better
14	Compliance EMI/RFI	Comply with FCC part 15,Class A EU EMC directive

5.1.2 L-Band Router (64 x 320) with control panel

A. General

(i) L band signal shall be received through RF cable from Receive Antenna via suitable splitter and L band OFC Link. The output of L band router shall be connected to IRDs.

(ii) L band Router should have Full fan out (splitting) facility such that it can be configured to route any of the input (64 input) carrying L band signal to any or all of the output (320 no. outputs).

(iii) It should have hot swappable dual redundant Power supply unit.

(iv) It should have hot swappable frame controller card or CPU Card.

(v) It should have Cross point Matrix module or Mid Matrix Card or Central Switch Board.

(vi) It should have hot swappable Input cards and hot swappable Output cards.

(vii) The unit shall be able to provide DC power to LNBCs either through inbuilt power supply or external power supply unit of the same make as of router.

(viii) The matrix should be modular and scalable to future expansion upto (64 x 384) as and when required.

(ix) The control of the L-band router (LBR) should be through OEM (L band Router) supplied NMS apart from the manual control & configuration through external control panel or control panel on router or front panel touch screen panel.

B. Technical Specification

Sl.	Parameter	Specification
1	Operating frequency	950 to 2150 MHz
2	**Isolation**	
a	Input to input	60dB (min.)
b	Output to output	60 dB (min.)
c	Input to output	50 dB (min.)
3	**Return loss**	
a	Input return loss	10 dB (min.)
b	Output return loss	10 dB (min.)
4	Input/output RF Connector	Type "F/BNC"
5	Impedance	75 ohm
6	Remote control	RS 232 or RS422/485 or RJ45 or other

5.1.3 Specification for Integrated Receiver Decoder (IRD)

A. General

(i) The professional IRDs should receive the L band input and give digital (SD-SDI, SD-SDI with Embedded Audio, AES/EBU, HD-SDI, HD-SDI with Embedded

Audio), ASI outputs and MPEG-2 TS over IP output with multiple services filtering facility and bulk decryption.

(ii) One SD-SDI down converted output of HD-SDI should be available.

(iii) IRD should be able to carry out multiple services filtering on IP output port.

(iv) IRD should have provision to enter or edit all the parameters for perfect reception of the signals through either front control panel display or Web browser.

(v) There shall be a provision for observing BER & signal level or C/N & C/N margin or Eb/No & Link Margin for DVB-S mode of operation and PER & signal level or C/N & C/N margin or Es/No & Link Margin for DVB-S2 mode of operation through either front control panel display or Web browser.

(vi) IRD should be able to bulk descramble BISS mode 1 and BISS-E signals.

(vii) There should be at least one vacant slot (CI slot) for each channel of conditional Access System (CAS) for descrambling all MPEG-2, H.264/MPEG 4 & H.265/HEVC encoded channel and DVB-S & DVB S2 compliant services. Each CI slot should be integrated/configured with atleast two L band input port.

(viii) There should be direct decompression of ASI to SDI i.e. not through analog to Digital conversion.

(ix) IRD should be able to store at least 10 presets channels configuration in memory.

(x) It should be possible to configure and monitor the IRD through NMS of compression system.

(xi) IRD should be able to generate and save log for alarms and warning through NMS of compression system.

(xii) IRD should have facility to pass ancillary data like closed captioning, EIA 608/708, DVB-Teletext, DVB- subtitle, DPI SCTE-35 etc.

(xiii) Bidder may offer server based professional IRDs in place of Hardware based IRDs. Each server chassis may accommodate two to four professional IRDs.

(xiv) In case of server based Professional IRDs, either external or internal audio De-embedder shall be integrated with server based Professional IRDs for taking Digital Audio outputs (AES/EBU) mentioned under DD Specs clause no. 5.1.3.F

B. RF Parameter Specifications

Sl. No.	Parameters	Specification
1	Input Frequency Range	950 - 2150 MHz
2	No. of Inputs	2 (min.)
3	Tuning Step Size	125 kHz, Max.
4	Satellite Frequency Band	C- Band & Ku-Band, Selectable
5	Input Impedance	75 Ohms
6	Input Connector	F-Type female
7	Input Power Range	-30 to -60 dBm per carrier
8	Image Rejection	>30 dB
9	Input Return Loss	9 dB Min.
10	Noise Figure	15 dB Max.
11	AFC Tuning Range	± 5 MHz
12	De-Modulation Method	DVB-S QPSK, DVB-S2 QPSK and 8PSK

13	Variable Symbol Rates	1.0 to 40 M Symbol /sec for (DVB-S) 1.0 to 40 M Symbol /sec for (DVB-S2)
14	Convolution Inner FEC selectable	R=1/2, 2/3, 3/4, 5/6,7/8 (DVB-S, QPSK), R=1/2, 3/5, 2/3, 3/4, 4/5,5/6, 8/9, 9/10 (For DVB-S2, QPSK) R= 3/5, 2/3 , 3/4, 5/6,8/9,9/10 (DVB-S2 , 8PSK)
15	IF Filter Bandwidth	Automatic Selection (dependent on Symbol Rate).

C. ASI Input and ASI Output Transport Stream specification

Sl. No.	Parameters	Specification
A	**ASI Input**	
1	Format	MPEG-2 TS over ASI on BNC
2	Quantity for ASI Input	Minimum one no. on BNC
B	**ASI Output**	
1	Format	MPEG-2 TS over ASI on BNC
2	Quantity for ASI Output	Minimum one no. on BNC

D. Audio and Video Decompression Parameters

Sl. No.	Parameters	Specification
1	Video Resolution (all resolutions shall be capable of I, P & B frame decoding, other standard solution should be selectable)	i) For SDTV 720 X 576 544 X 576 480 X 576 ii) For HDTV 1920x1080 1440x1080
2	Video Decompression Type	i) SD MPEG-2, MP@ML, 4:2:0 ii) SD MPEG-4, MP@ L3, 4:2:0 iii) SD MPEG-4, Hi422@ L3, 4:2:2 iv) HD H.264 MP@ Level 4.0 4:2:0 v) HD H.264 Hi422 @ Level 4.0, 4:2:2 vi) HD H.265/HEVC Main 10 4:2:0
3	Television Standard	PAL-B (EN50083-9)
4	Audio Decompression Type	i) MPEG-1 Layer-II audio ii)HE AAC(MPEG 4) v1 & v2 5.1 Audio iii)Dolby Digital (AC-3) 5.1 Audio iv) Dolby Digital plus 5.1 Audio (E-AC-3) (Pass through) v) Dolby E (Pass-through)

E. Digital Video output Specifications (SD-SDI & HD-SDI)

Sl. No.	Parameters	Specification
1	SD-SDI and HD-SDI O/P Serial Interface	SMPTE 259M-(10 bit) 270 Mbps SMPTE 292M-1485 Mbps
2	SD-SDI with Embedded Audio	SMPTE 272M
3	HD-SDI with Embedded Audio	SMPTE 299 M
4	Video Output Format	HD-SDI and SD-SDI
5	Connector Type	BNC (75 Ohms)
6	Quantity	Minimum 2 Nos. of digital output compliant to ITU-R BT.656 Standard or latest
7	Level	800mV p-p for SDI As per ITU-R BT.601 (part A) and ITU-R BT.709

F. Digital Audio Output Specifications

Sl. No.	Parameters	Specification
1	Output Format	i) AES/EBU or AES3 id ii) HE AAC(MPEG 4) v1 & v2 5.1 Audio iii)Dolby Digital (AC-3) 5.1 Audio iv) Dolby Digital Plus 5.1 Audio (E-AC-3) (Pass- through) v) Dolby E (Pass-through)
2	Load Impedance	75Ohms/110 Ohms
3	Connector Type	BNC Female / XLR male Socket or with suitable XLR adapter (i.e. no terminal block)
4	Number of Output	4 Stereo Channels

G. LNB Power Supply & Control

Sl. No.	Parameters	Specification
1	LNB Voltage	+ 13 V (Vertical) and 18 V (Horz) polarizations switching or 19 V fixed.
2	Power Consumption	300 mA. (Max.)
3	Over Current and short circuit protection	Fold back current limiting.
4	LNB Power Supply & Control	Receive Polarization Control by electrical Command Via LNB-IF feeder (High & Low band switching Pulse for Ku-Band operation).

H. IP Input (TS & Data) and IP Output (TS & Data) specification

Sl. No.	Parameters	Specification
A	**IP Input**	
1	Format	(i) MPEG 2 TS over IP (SPTS & MPTS) (ii) RTMP stream (iii) HLS stream

		(iv) SRT Stream
2	Quantity for IP Input	Minimum two nos. RJ 45 if Uni-directional ports OR Minimum one no. RJ 45 if Bi-directional port
B	**IP Output**	
1	Format	MPEG-2 TS over IP on Ethernet with multiple services filtering facility and decryption.
2	Quantity for IP Output	Minimum two nos. RJ 45 if Uni-directional ports OR Minimum one no RJ 45 if Bi-directional port

I. Size

Sl. No.	Parameters	Specification
1	Mount	19" Rack Mount

J. Hardware of Server in case of Server Based Professional IRDs

(a)	General Feature:
i	Bidder may offer server based professional IRDs in place of Hardware based professional IRDs. Each Chassis may accommodate two to four professional IRDs.
ii	CPU/Chipset of server should have facility to enable an environment where applications can run within their own space, protected from all other software on the system.
iii	CPU/Chipset of server should have security feature that can reduce exposure to viruses and malicious-code attacks and prevent harmful software from executing and propagating on the server or network.
iv	CPU/Chipset of server should have facility of Secure Key consisting of a digital random number generator that creates truly random numbers to strengthen encryption algorithms.
v	CPU/Chipset of server should have Thermal Monitoring facility to protect the processor package and the system from thermal failure.
vi	The offered processor of server should be scalable, high quality, robust with efficient performance.
vii	Each server of software based professional IRDs should be designed with 85 percent (Max.) CPU loading.
viii	CPU of server shall be similar to Intel Xeon Gold series / Intel Xeon W Series/AMD EPYC 3rd Generation Series or better and the launch date of CPU of offered server should not be prior to year 2021.
ix	Facility to store the last configuration in the software based professional IRDs.

Himanshu Goel 15/5/25

(b)	Hardware Feature:	
S. No.	Parameter	Specification
A.	**Performance of Central Processing Unit**	
1	No. of Core	10 (Min) per CPU
2	No. of Thread	20 (Min.) per CPU
3	Processor Base Frequency	2.40 GHz or better
4	No. of CPU	One or more
B.	**Memory Specification**	
5	RAM	DDR4 or better, 32 GB or more
6	Storage Memory	SSD, 240 GB (Min.)
C.	**Operating System**	
7	Operating System	Linux
D.	**Ethernet Network**	
8	No. of Ports (Duplex) in Server	i. Minimum one physical (RJ 45) bi-directional port of 1 Gigabit for Input ii. Minimum two physical (RJ 45) bi-directional port of 1 Gigabit for output iii. Minimum one physical (RJ 45) bi-directional port of 1 Gigabit for Management & Control
E.	**PCI slot**	
9	PCI slot	2 nos. or more
F.	**Operating Environment**	
10	Operating Temperature	10 to +35 °C
11	Humidity	10% to 90% non-condensing

5.1.4 Specifications for 8 AES Digital Audio & SDI Video Multiplexer Unit (Embedder) for Radio Service

A. General

1) The offered product should auto detect the defined standard of video input signal.
2) It should be able to provide programmable audio delay for lip sync issues.
3) The offered Embedder should have excellent performance features like "high Input impedance", "flat frequency response", "very low total harmonic distortion" and "extremely high signal to noise ratio (S/N)".
4) It should be able to remove all available audio before embedding or allow overwriting.
5) It should be able to embed AES on output without video source or genlock i.e. on Internal Colour bar.
6) It should be able to provide high quality cable equalization to the input signal up to the length of minimum 100 m @1.5 Gb/s & 300m @270 Mb/s cable
7) Monitoring software should allow configuration and status of the card.

8) Visual indicators should also give its status about power supply, input etc.

9) 19" rack Frame with Frame controller for remote configuration & monitoring; and auto switchable dual redundant power supply unit. Upto Two Audio embedder card shall be fitted in each Frame.

B. Technical Specifications

(a)	**Input:**		
i.	Digital Audio Inputs	:	AES3
ii.	No. of Audio Input		8
iii.	Connector type		DIN/BNC/XLR with suitable adapter
iv.	Impedance		110 Ohm balanced Or 75 Ohm Unbalance
v.	Serial digital video Input	:	1 no. HD/SD-SDI & Internal colour bar
vi.	No. of Outputs	:	2 or more HD/SD-SDI signal with Embedded audio
vii.	Serial input & output return loss	:	≥ 10 dB up to 3 GHz

5.1.5 4.5 m to 4.8m Manually Operated motorized C band Receive Antenna:-

A. Feature

(i) This antenna would be used to receive satellite down link signals in C band. Antenna reflector should be made of lightweight material.

(ii) Azimuth, Elevation offset angles (Calibrated and absolute) shall be available for the operator at the base of the antenna.

(iii) There shall be manually operated motorized facility for independent movement of antenna in Elevation & Azimuth direction and also for fine correction of polarization.

(iv) Repeat accuracy of the performance should be ensured by the manufacturer.

(v) All the petals and struts are to be marked by stamping for proper placing during reassembling.

(vi) No major field alignment is required at the site for getting the specified performance.

(vii) Descriptive details of the antenna installation should be provided, along with antenna foundation details, including bar bending schedule, bill of materials and procedure to be followed in the installation.

(viii) All iron parts should be hot galvanized (Minimum 100 microns).

(ix) Bidder will have to supply, install, test and commission the PDA.

(x) Bidder shall provide PDA foundation on ground.

(xi) Detailed diagram showing the Antenna foundation & installation and connection of accessories must be given along with the offer for approval. As an SITC

contract, material, labour for earthing, earth pits, Lightening arrester for antenna etc. should be included.

(xii) The foundation drawing of PDA shall be approved by OEM of PDA.

B. Technical Specification

Sl. No.	Parameter	Specification
1	Antenna Type	**Parabolic Prime Focus/Cassegrain/Gregorian optics (feed).**
2	Reflector Type	Single piece solid or Segmented solid
3	Reflector Material	Aluminum Stretched formed or Precision formed or GFRP with UV protection SMC coating
4	Size	4.5 m to 4.8m
5	Mount	Mount of Elevation and Azimuth for independent movement
6	Frequency of operation (Receive C-Band)	3.7 GHz to 4.2 GHz
7	Gain (Receive C-band)	42.2 dBi (min) at mid band
8	Feed	2 Port (H & V) C-band receiving both linear orthogonal polarized signals
9	Polarization type	Linear orthogonal
10	Drive System	Manually operated Motorized
11	Steer ability	Manually operated Motorized
	a) Azimuth	Steer ability of Motorized Antenna control system, Azimuth should be 110 degrees continuous
	b) Elevation	Steer ability, Elevation 5 deg to 85 deg
	c) Polarization	± 90 deg (min).
12	Cross Pole Isolation	30 dB (min)
13	VSWR (receive)	≤ 1.5: 1
14	Wind Speed	
	a)Operational	Upto 70 KMPH
	b)Survival	upto190 KMPH
15	Waveguide Flanges (Receive C band)	CPR 229G
16	Feed Impedance	Matching with LNBC

C. Manually operated Motorised Antenna Controller

(i) Manually operated Motorised antenna controller unit shall have control facility for all the three axis (AZ/EL/POL) for orientation of Receive Antenna.

(ii) Manually operated Motorised Antenna Controller unit shall be outdoor type and to be installed near Receive Antenna.

15/05/25

5.1.6 Specification for 4.5 m to 4.8m Auto tracking motorized C- band Receive Antenna

A. Feature

a. This antenna would be used to receive satellite down link signals in C band. Antenna reflector should be made of lightweight material.

b. Azimuth, Elevation offset angles (Calibrated and absolute) shall be available for the operator at the base of the antenna.

c. There shall be auto tracking motorized facility for independent movement of antenna in Elevation & Azimuth direction and also for fine correction of polarization.

d. Repeat accuracy of the performance should be ensured by the manufacturer.

e. All the petals and struts are to be marked by stamping for proper placing during reassembling.

f. No major field alignment is required at the site for getting the specified performance.

g. The detailed schematic diagram showing the Antenna foundation & installation and connection of accessories, including bar bending schedule, bill of materials and procedure to be followed in the installation must be given along with bid. Whereas the successful bidder shall submit the OEM approved Antenna foundation drawing & installation and connection of accessories, to DGDD for approval.

h. All iron parts should be hot galvanized (Minimum 100 microns).

i. Bidder will have to supply, install, test and commission the PDA.

j. Bidder shall provide PDA foundation at 500 mm above the ground level.

k. Detailed diagram showing the Antenna foundation & installation and connection of accessories must be given along with the offer for approval. As an SITC contract, material, labour for earthing, earth pits, Lightening arrester for antenna etc. should be included.

l. The foundation drawing of PDA shall be approved by OEM of PDA.

B. Technical Specification

Sl.	Parameter	Specification
1	Antenna Type	**Parabolic Prime Focus/Cassegrain/Gregorian optics (feed).**
2	Reflector Type	Single piece solid or Segmented solid
3	Reflector Material	Aluminum Stretched formed or Precision formed or GFRP with UV protection SMC coating
4	Size	**4.5 m to 4.8 m**
5	Mount	Mount of Elevation and Azimuth for independent movement

6	Frequency of operation (Receive)	3.7 GHz to 4.2 GHz
7	Gain (Receive)	42.2 dBi (min) at mid band
8	Feed	2 Port (H & V) C-band receiving both linear orthogonal polarized signals
9	Polarization type	Linear orthogonal
10	Drive System	Motorized with Auto and Manual Tracking facility
11	Steer ability	Motorized Antenna control system for auto and Manual tracking
	a) Azimuth	Steer ability of Motorized Antenna control system, Azimuth should be 110 degrees continuous
	b) Elevation	Steer ability, Elevation 5 deg to 85 deg
	c) Polarization	± 90 deg (min).
12	Cross Pole Isolation	30 dB (min)
13	VSWR (receive)	≤ 1.5: 1
14	Wind Speed	
	a)Operational	Upto 70 KMPH
	b)Survival	upto190 KMPH
15	Pointing stability	<± 0.2 deg.
16	Waveguide Flanges	CPR 229 Flange
17	Port	2 Port receiving both linear orthogonal polarized signals
18	Feed Impedance	Matching with LNBC

5.1.7 Antenna Control Unit (Antenna Controller) with Step Tracking

(i) Antenna controller should be of the same make as the antenna or it should be of approved by Antenna OEM.

(ii) The controller should display the current position of Azimuth, elevation and polarization with relative power reference of the received tracking signal strength.

(iii) The antenna controller unit shall be kept at a distance of approx 100 meters away from the antenna. Necessary cabling etc. is to be provided.

(iv) Tracking accuracy should be better than 10% of the receive 3 dB beam width.

(v) Position Encoding should use single speed brush less revolvers or highly reliable encoders.

(vi) Position Encoding resolution: 10 bit

(vii) The system should also have manual control flexibility for all the three axes.

(viii) Antenna controller should be of rack mount type.

(ix) Controller should have following control modes- Manual, step track, Program track, move to look angles etc.

5.1.8 Beacon Tracking Receiver

A. General

Fully frequency agile satellite receiver designed to provide a linear DC reference voltage proportional to the received signal of a satellite beacon.

BTR shall be of the same make as the antenna or it shall be of approved by Antenna OEM (A certificate from antenna OEM should be submitted along with the offer)

B. Beacon Receiver Requirements

Sl.	Parameter	Specification
1	Voltage output	0 to +10 V DC or 0 to –10 V DC
2	Contact closure status outputs	closure for fault or open fault

C. Power requirements

Sl.	Parameter	Specification
1	Frequency	48-52 Hz
2	Power consumption	40 W typical

D. Connectors

Sl.	Parameter	Specification
1	Signal path	BNC /N type female
2	Beacon level voltage inputs	BNC /N-type female
3	Receiver fault inputs	DE-9P
4	Status outputs	DB-25S
5	Remote interface RS485,RS422	DE-9S

E. Technical Specifications

Sl.	Parameter	Specification
1	Frequency	3.7 GHz to 4.2 GHz with 10 KHz step
2	I/P level	-30 to –70 dBm
3	Tracking slope	0.5 V/dB
4	I/P connector	SMA 50 Ohms
5	O/P connector	Suitable to feed to the Antenna Control Unit as well as Uplink Power Control system
6	Tracking response	0 to + 10 V or 0 to –10 V DC over 20 dB attenuation range in 0.1 dB steps
7	Tracking linearity	±0.5 dB

8	Threshold	4 dB C/N for acquisition ; less than 1 dB C/N for carrier lock
9	AFC	± 25 KHz
10	Type	19" rack mountable

5.1.9 Specification for LNBC (Digital PLL C band)

Sl. No.	Parameter	Specification
1	Input frequency range	3.7 GHz to 4.2 GHz
2	RF Rejection Range	<3.650 GHz and >4.250 GHz (25dB or better)
3	Local Oscillator frequency	5.150 GHz
4	L.O. Stability	± 10 KHz Max
5	L.O. Phase noise	Should meet the requirements of IESS-308
6	Output frequency	950 MHz to 1450 MHz
7	Conversion gain	55 dB (min.)
8	Gain response	Better than ± 1 dB/40 MHz
9	Output level at 1dB compression point	5 dBm (min.)
10	Output Connector	F connector
11	Input VSWR	Better than 2.5:1
12	Output VSWR	Better than 2.5:1
13	Noise Temperature	Better than 30 deg K
14	Power supply requirement	Should work between + 15V to +24V With current consumption of about 400mA (max.)
15	Input flange	CPR 229G

16	LNBC Type	C-band PLL LNBC with built-in Bandpass Filter
17	Operating Temperature	-30 to +50°C
18	Protection	IP 67 or IP 66

5.1.10 Specification for C-Band Interference Rejection Bandpass Filter

A.	**General:**	
(i)	BPF should be easily installed between the feed and LNBC	
(ii)	BPF should rejects terrestrial interference in C-Band reception as per specification	
B.	**Technical Specification:**	
S. No.	**Specification**	**Parameter**
(i)	Frequency Range of Pass band* *Exact Frequency Range of Pass Band will be provided to successful bidder at the time of issue of AT)	3.70 GHz to 4.20 GHz (Typical)
(ii)	Central Frequency	3.950 GHz or As per Exact Frequency Range of Pass Band
(iii)	Lower Guard Band	30 MHz or as per standard norms
(iv)	Upper Guard Band	30 MHz or as per standard norms
(v)	RF Rejection	
(a)	Below Lower Guard Band	>55 dB
(b)	Start Frequency	≤ 1.8 dB
(c)	Mid Band Frequency	≤ 0.5 dB
(d)	Stop Frequency	≤1.8 dB
(e)	More than Upper Guard Band	≥25 dB
(vi)	Maximum VSWR in the passband	1.4:1 Max.
(vii)	Insertion Loss in passband	1.85 dB Max.

(viii)	Group Delay with +/- 0.5 MHz	3 n Sec
(ix)	Flanges (Input)	CPR-229G
(x)	Flanges (Output)	CPR-229F
(xi)	Protection	IP 67 or IP 66
(xii)	Operating Temperature range of BPF	-30°C to +50°C

5.1.11 Specification for the Low loss cable

Low loss cable is to be supplied for connecting L band signal from Receive Antenna to L band Router; and as per site and project requirement for other places where required length is more than 30 meter. The cable should have 75 ohm impedance and Attenuation (dB / 100 meter) at different frequencies as below –

SL.	Frequency (MHz)	Maximum Attenuation of cable upto (dB/100meters)
1	100	4.5
2	200	6.5
3	500	10.5
4	1000	15.0
5	1400	17.6
6	1800	20.0
7	2150	22.0

5.1.12 Specification for the Low loss cable

Low loss cable is to be supplied for connecting L band signal from L band Router to IRDs; and as per site and project requirement for rack wiring. The cable should have 75 ohm impedance and Attenuation (dB / 100 meter) at different frequencies as below –

SL.	Frequency (MHz)	Maximum Attenuation of cable upto (dB/100meters)
1	135	12.8
2	180	14.5
3	270	17.9
4	1000	35.8
5	1500	44.5
6	2000	53.5

15/05/25

5.2 Digital Compression System

i) The baseband and MPEG 2 TS over IP signals to the Input of the Encoders are to be brought from IRDs installed in Input rack via SDI Router & IP Data Switch. All the compression equipment should preferably be from one OEM/company or approved by OEM of compression system, for ease of operation, networking and full automation. The system management should be through NMS. The compression system shall comprise basically a minimum of the following equipment:

a) 64x64 SD/HD-SDI Routing Switcher

b) Chassis consisting of multiple MPEG-2 & MPEG-4 SDTV and MPEG-4 & HEVC HDTV Video Encoder

c) IP Encapsulator cum Multiplexer for Statistical Multiplexing with DVB-CSA (V-1 & V-2) supported DVB-CAS(CAS) simulcrypt encryption

d) IP Data Switch

e) Compression Control system Computer (Hardware and Software) i.e. Network Management System (NMS)

f) 16 x 16 or better matrix of SDI/ASI Router

g) EPG and PSI/SI Generator/Server

h) GPS enabled NTP Time Server

i) IP Router

j) Bi-directional SRT based Gateway System

ii) The compression system should have facility to insert Logo (JPEG/PNG, GIF/HTML file) for each channel either in encoder or in multiplexer. Alternatively, separate logo inserter unit can also be offered.

iii) All the Compression equipment like SDI Router, Encoders and IP Encapsulator cum Multiplexer, IP Switches, IP Router, ASI Router, EPG and PSI/SI Generator, NTP Server etc shall be compatible with IP based interface.

iv) All the Electronic equipment should have necessary control interfaces through RS 232 / RS 422/ RS 485/ RJ45 etc so that they can be interfaced with a Control Computer for remote monitoring and control with suitable GUI. The associated software for logging, archiving, monitoring and controlling along with the accessories should also be made available.

5.2.1 Specification for 64 x 64 SD/HD-SDI Routing Switcher

A. General:

The routing Switcher should be very reliable and able to be used for selection of any one of the 64 HD-SDI input signals to 64 HD-SDI different destinations. All 64 x 64 input and destinations shall also be SD-SDI. The equipment so offered should be for professional set-up applications. The Router has to be quoted with X-Y and Single Bus Remote Control Panels.

B. Essential features:

(i) The routing switcher electronics should be capable of being mounted in a standard 19" rack frame.

(ii) The rack frame should be modular to house input, output, control and power supply modules.

(iii) The switcher shall handle HD-SDI & HD-SDI with embedded audio, SD-SDI & SD-SDI with embedded audio and ASI signal for routing from input to output destinations of their respective port. The switching should take place during the vertical interval period.

(iv) The switcher should have storage facilities for control information, so that in case of power supply failure, the status of the switcher output should remain unchanged when the power supply is restored.

(v) The switcher should have redundant cross point card/module and redundant controller/ logic cards to achieve complete (1+1) redundancy.

(vi) The switcher should have auto-switchable redundant dual power supplies.

(vii) A certificate from Compression OEM regarding compatibility with compression NMS is required to be submitted for offered router along with the bid.

(viii) Any of the 64 HD-SDI and SD-SDI input shall be capable of being switched to any or all of 64 outputs port.

C. Technical Specification:

Sl. No.	Parameter	Specification
1	Matrix size	64 x 64 for HD-SDI and SD-SDI port
2	Input and Connector	HD-SDI with embedded audio (including Dolby AC-3 5.1 audio & Dolby E, SD-SDI with embedded audio, and ASI (BNC/HD BNC; 75 ohms)
3	Equalization for SD-SDI signal	Automatic: 150 Meters at 270 Mbps.
4	Equalization for HD-SDI signal	Automatic: 80 Meters at 1.485 Gbps.
5	Output and Connector	One or more HD-SDI SDI with embedded audio (including Dolby AC-3 5.1 audio & Dolby E) and SD-SDI with embedded audio for each of 64 HD & SD SDI destinations; BNC/HD BNC; 75Ω, 800 mV±10%.

6	Return Loss	≥10 dB on data rate upto 1485 Mb/s throughout the switching chain.

5.2.2 Specification for SDTV Encoder in MPEG-2 & H.264/MPEG-4-AVC Compression and HDTV Encoder in H.264/MPEG-4-AVC & H.265/HEVC Compression Configuration

A. Configuration of Encoding System:

(i) Bidder shall supply, install, test and commission (SITC) 8 sets of compression system having H.264/MPEG-4 and H.265/HEVC compliant Encoders in (X+2) chassis configuration wshere "X" is no. of chassis comprising of atleast 16HDTV Encoders with SDI input per stream. "X" no. of these encoder chassis shall also be capable to take atleast 40 SDTV signal with SDI input and compress them to MPEG-2 and H.264/MPEG-4 compression format without any limitation or requiring upgradation /downgrading by way of hardware and software. Each encoder chassis shall have 4 to 10 BNC/HD BNC/Micro BNC/DIN/Mini DIN Female ports enabled for feeding SD/HD SDI input signal. Each encoder chassis should have same hardware and software licenses.

For example, if bidder offers encoder chassis with 10 BNC/ HD BNC/Micro BNC/DIN/Mini DIN Female port, the probable combination/configuration of channels to be compressed in each chassis are tabulated below:

Groups/Combinations (at a time anyone)	No. of BNC/ HD BNC/Micro BNC/DIN/Mini DIN Female Ports enabled per chassis	No. of SDTV Channel to be compressed in MPEG-2 & H.264/MPEG-4 (at a time anyone standard) with SDI Input	No. of HDTV Channel to be compressed in H.264/MPEG-4 & H.265/HEVC (at a time anyone standard) with SDI Input	Total No of TV channels to be compressed in Each chassis
(a)	10	10	0	10
(b)	10	9	1	10
(c)	10	8	2	10
(d)	10	6	4	10

(ii) All the above encoder chassis of compression system shall also be capable to take MPEG-2 TS over IP input with decoding of MPEG-2, H.264/MPEG-4-AVC and H.265/HEVC Main 10 compressed contents to base band signal format. All encoder chassis with MPEG-2 TS over IP input shall be capable to encode minimum 4 HDTV channel in H.264/MPEG-4-AVC & H.265/HEVC Main 10 (at a time anyone standard) and minimum 16 SDTV channel in MPEG-2 & H.264/MPEG-4 (at a time anyone standard) without any limitation or requiring upgradation/downgrading by way of hardware and software licenses.

The probable combination/configuration of channels to be compressed by enabling various filters (Noise Filters, Pre-processing, etc) are tabulated below:

Groups/Combinations (at a time anyone)	No. of SDTV Channels to be compressed in MPEG-2 & H.264/MPEG-4 (at a time anyone standard with MPEG-2 TS over IP Input)	No. of HDTV Channels to be compressed in H.264/MPEG-4 & H.265/HEVC (at a time anyone standard with MPEG-2 TS over IP Input)	Total No of TV channels to be compressed in each chassis

(a)	16	0	16
(b)	13	1	14
(c)	9	2	11
(d)	6	3	9
(e)	4	4	8

(iii) Further, offered Encoder shall also be configurable to encode SDI & IP inputs simultaneously. The probable combination/configuration of channels to be compressed by enabling various filters (Noise Filters, Pre-processing, etc) are tabulated below:

Group/ Combination of SDI and IP Input (at a time anyone)	No. of SDTV Channel to be compressed in MPEG-2 & H.264/MPEG-4 (at a time anyone standard) with SDI Input	No. of HDTV Channel to be compressed in H.264/MPEG-4 & H.265/HEVC (at a time anyone standard) with SDI Input	No. of SDTV Channels to be compressed in H.264/MPEG-4 (at a time anyone standard with MPEG-2 TS over IP Input)	No. of HDTV Channels to be compressed in H.264/MPEG-4 & H.265/HEVC (at a time anyone standard with MPEG-2 TS over IP Input)	Total No of TV channels to be compressed in Each chassis
(a)	10	0	6	0	16
(b)	8	0	8	0	16
(c)	6	1	2	1	10
(d)	2	2	2	2	8
(e)	0	4	4	0	8
(f)	4	0	0	4	8

B. Features of Encoder

(i) There should be dual redundant SMPS power supply units per Chassis. In case of Single power supply unit in encoder chassis, bidders can offer additional chassis which shall be populated with same no. of encoders with single power supply unit for the completeness of the offer as an alternative to inbuilt redundant power supply unit.

(ii) It should also have the preprocessing facility for the efficient encoding process viz; adaptive noise reduction.

(iii) It should have multi-pass encoding.

(iv) It should have interface for Remote Control.

(v) It should generate PSI.

(vi) On loss of Video input, it should have option to auto switch to pre-recorded Image (JPEG/PNG, GIF/HTML format) and in case of "No video Input", it should be configurable to 'No video output".

(vii) The encoder shall be MPEG-2, MPEG-4 and HEVC standard compliant without any limitation or upgradation by way of hardware or software licenses.

(viii) There should be provision for 4 stereo audio with MPEG-1 Layer-II & HE AAC v1 & v2 5.1 audio encoding in each SDTV encoder.

(ix) There should be provision for 4 stereo audio with Dolby Digital (AC-3) 5.1 decoding & encoding, Dolby Digital plus 5.1 decoding & encoding, MPEG-1 Layer-II & HE AAC v1 & v2 5.1 audio encoding in each HDTV encoder which may enable to encode the audio in Dolby Digital (AC-3) 5.1 and Dolby Digital Plus 5.1 audio with down-mix of one MPEG-1 Layer-II at any given point of time.

(x) There should be audio loudness control in each channel for maintaining uniform audio level in spite of changes from different input feeds and programs meeting the ITU-BS-1770-2/ITU-BS-1770-3 standard for loudness control.

(xi) The Encoder shall be closed captioning compliant with EIA 608/708, DVB-subtitling and digital program insertion compliant with SCTE35 insertion via SCTE104 triggers without any limitation or upgradation by way of hardware or software licenses.

(xii) The encoded output of chassis should be MPEG-2 TS over IP on RJ45 connector.

(xiii) Encoder hardware/Server shall decode RTMP, HLS, SRT & ZIXI IP Input stream of TV and Radio Services in various format as mentioned below under clause "5.2.2.F" and these services shall be re-encoded; and encapsulated in the output of transport stream by IP Encapsulator cum Multiplexer. In addition to above, Encoder hardware/Server shall also be capable for encoding/streaming of TV & Radio services in RTMP, DASH, HLS format, so that it may be enabled by additional licenses in future, if required.

(xiv) There should be provision for internal de-embedding of 8 AES audio channel from SDI input and thereafter these de-embedded 8 AES audio channel shall be encoded and configured to 8 Radio channel in each encoder chassis.

(xv) Audio licenses provisioned for TV Channels shall be capable to encode Radio Channels without any limitation or upgradation by way of hardware or software licenses.

C. Serial Digital Interface (SDI) Input Specifications

Sl.No.	Parameter	Specification
1	Video Inputs	SD-SDI & HD-SDI with embedded audio
2	Serial Interface	i) SMPTE 292M, 1485 Mb/s (10 bit) with embedded audio ii) SMPTE 259M, 270 Mb/s (10 bit) with embedded audio
3	Format	ITU(R)-BT. 601 & ITU-R BT.709
4	Connector	BNC/HD BNC/Micro BNC/DIN/Mini DIN Female,75 ohm
5	Physical SDI Port enabled	i) Minimum 4 Port ii) Maximum 10 Port
6	Input Level	800 mV p-p nominal ±10%, SDI input
7	Return Loss	≥15 dB from 5 MHz to 1.5 GHz /OR ≥10 dB on data rate upto 1485 Mbps

D. Embedded Serial Digital Audio Input Specifications

Sl. No.	Parameter	Specification
1	Serial interface	a) SMPTE 272M b) SMPTE 299M
2	Format	AES/EBU, 4 stereo channels
3	Connector	BNC/HD BNC/Micro BNC/DIN/Mini DIN Female,75 ohm

E. IP Transport Stream Input Specifications

Sl. No.	Parameter	Specification
1	Type	Gigabit Ethernet
2	MPEG Format	MPEG 2 TS over IP (SPTS & MPTS)
3	Decoding of Video from TS	i) MPEG-2 ii) H.264/MPEG-4-AVC iii) H.265/HEVC Main 10
4	Decoding of Audio from TS	i) MPEG-1 Layer-II ii) HE AAC V1 & V2 5.1 Audio iii) Dolby Digital AC-3 5.1 Audio iv) Dolby Digital Plus 5.1 E-AC-3 Audio
5	No of Ports dedicated for IP Input source	Minimum two nos. independent ports and configurable in redundant mode
6	Port Speed	1000 Mbps or better per port
7	Ethernet Interface	1000 base T or better
8	Ethernet Connectors	RJ 45

F. IP Streaming Input Specifications

Each encoder chassis shall have the facility to pull the channel from Cloud/URL. Thereafter, channel may be decoded; and encoded in desired format for multiplexing with external IP Encapsulator cum Multiplexer. Input format of IP stream is given below:

1. RTMP IP Streaming Input Format of TV Service

i) HDTV Channel

Input Format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
RTMP	MPEG TS i.e. (.TS)	1	H.264	High	1920 x 1080	AAC-LC, V1,V2,	Stereo, Mono for AAC-LC, V1 and V2
		2	H.264	High	1440x1080	AAC-LC, V1,V2	Stereo, Mono for AAC-LC, V1 and V2
		3	H.264	High	1280x720	AAC-LC, V1,V2	Stereo, Mono for AAC-LC, V1 and V2

10/05/25

ii) SDTV Channel

Input Format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
RTMP	MPEG TS i.e. (.TS)	1	H.264	High	720 x 576	AAC-LC, V1,V2,	Stereo, Mono for AAC-LC, V1 and V2
		2	H.264	High	544 x 576	AAC-LC, V1,V2,	Stereo, Mono for AAC-LC, V1 and V2
		3	H.264	High	480x576	AAC-LC, V1,V2,	Stereo, Mono for AAC-LC, V1 and V2

2. HLS IP Streaming Input Format of TV Service

i) HDTV Channel

Input format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
HLS	MPEG TS i.e. (.TS)	1	H.264 & HEVC	High	1920 x 1080	AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		2	H.264 & HEVC	High	1440 x 1080	AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		3	H.264 & HEVC	High	1280x720	AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+

ii) SDTV Channel

Input Format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
HLS	MPEG TS i.e. (.TS)	1	H.264 & HEVC	High	720 x 576	AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		2	H.264 & HEVC	High	544 x 576	AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2

							5.1 for DD & DD+
		3	H.264 & HEVC	High	480x576	AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+

3. SRT IP Streaming Input Format of TV Service

i) HDTV Channel

Input format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
SRT	MPEG TS i.e. (.TS)	1	H.264 & HEVC	High	1920 x 1080	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		2	H.264 & HEVC	High	1440 x 1080	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		3	H.264 & HEVC	High	1280x720	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo for AAC-LC, V1 and V2 5.1 for DD & DD+

ii) SDTV Channel

Input Format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
SRT	MPEG TS i.e. (.TS)	1	H.264 & HEVC	High	720 x 576	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		2	H.264 & HEVC	High	544 x 576	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		3	H.264 & HEVC	High	480x576	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+

Shimanshu 15/05/25

4. ZIXI IP Streaming Input Format of TV Service

i) HDTV Channel

Input format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
ZIXI	MPEG TS i.e. (.TS)	1	H.264 & HEVC	High	1920 x 1080	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		2	H.264 & HEVC	High	1440 x 1080	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		3	H.264 & HEVC	High	1280x720	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo for AAC-LC, V1 and V2 5.1 for DD & DD+

ii) SDTV Channel

Input Format	Streaming Format	Profile Number	Video Decoding standard	Profile	Video Resolution	Audio Decoding Standard	Type of Audio channels
ZIXI	MPEG TS i.e. (.TS)	1	H.264 & HEVC	High	720 x 576	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		2	H.264 & HEVC	High	544 x 576	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+
		3	H.264 & HEVC	High	480x576	MPEG-1 L-II, AAC-LC, V1,V2, DD, DD+	Stereo, Mono for AAC-LC, V1 and V2 5.1 for DD & DD+

5. Input Format of Radio Service received through IP Streaming

Input Format	Profile Number	Streaming Format	Audio Decoding Standard	Type of Audio channels
HLS	1	(i) MPEG TS i.e. (.TS) (ii) Raw audio format(.aac)	(i) AAC-LC, (ii) HE-AAC V1, (iii) HE-AAC-V2,	Stereo , Mono for AAC-LC, V1 and V2

Each Encoder chassis shall have the facility to encode minimum 8 Radio Service received through IP Input streaming.

G. Video compression parameters

Sl. No.	Parameter	Specification
1	Video Resolutions (PAL)	For SDTV 720 x 576, 544 x 576, 480 x 576, For HDTV 1920 x 1080 1440 x 1080
2	Profiles and Levels	i) SD MPEG-2, MP@ML ii) SD H.264/MPEG-4, MP@ L3 iii)HD H.264 Main Profile Level 4.0 iv)HD H.264 High Profile Level 4.0 v) HD H.265/HEVC Main 10
3	Video Bit-rate	i) 500 Kbps to 4 Mbit/s for 4:2:0 Profiles of SDTV on MPEG-2 depending upon Resolution ii) 3 to 20 Mbit/s for 4:2:0 Profiles of HDTV in MPEG-4 depending upon Resolution iii) 3 to 8 Mbit/s for 4:2:0 Profiles of HDTV in HEVC depending upon Resolution
4	Temporal Processing	I, B, B, P frames structure to support low delay mode with latency Delay of 3.5 Seconds or less
5	Coding of Interlaced Video	Adaptive field & frame Processing support
6	Spatial Redundancy	Discrete Cosine Transform (DCT) Reduction
7	Chrominance Format	4:2:0
8	Aspect Ratio	4:3 and 16:9
9	Type of Encoding	Variable bit rate

H. Audio Compression Paramètres

Sl. No.	Parameter	Specification
1	Audio Encoding Method	i) MPEG-1 layer II ii) HE-AAC (MPEG-4) v1 & v2 5.1 Audio iii) Dolby Digital 5.1AC-3 audio

11/05/25

15/5/2025

		iv) Dolby Digital Plus 5.1 E-AC-3 audio
2	Data rate	i) 64-192 kbps (MPEG-1, layer II) ii) 32-72 kbps (MPEG-4, HE AAC V1 encoding) iii)16-48 kbps (MPEG-4, HE AAC V2 encoding) iv) 224-640kbit/s (Dolby Digital 5.1 audio encoding) v) 192-640kbit/s (Dolby Digital Plus 5.1 audio encoding)

I. IP Transport Stream Output Specification

Sl. No.	Parameter	Specification
1	Type	Gigabit Ethernet
2	MPEG Format	MPEG 2 TS over IP
3	No of Ports dedicated for IP Output	Minimum two nos. independent ports and configurable in redundant mode
4	Speed	1000 Mbps or better per port
5	Addressing	Unicast and Multi cast (at a time only one).
6	Ethernet Interface	1000 base T or better
7	Ethernet Connectors	RJ 45

J. Control and configuration of Encoder chassis

Sl. No.	Parameter	Specification
1	Control port	Min. 1 no. 10/100/1000 Base-T Ethernet port for NMS
2	Connector Type	RJ 45

K. Hardware of Server in case of software compression solution

a) General Feature:

i. CPU/Chipset of server should have facility to enable an environment where applications can run within their own space, protected from all other software on the system.

ii. CPU/Chipset of server should have security feature that can reduce exposure to viruses and malicious-code attacks and prevent harmful software from executing and propagating on the server or network.

iii. CPU/Chipset of server should have facility of Secure Key consisting of a digital random number generator that creates truly random numbers to strengthen encryption algorithms.

iv. CPU/Chipset of server should have Thermal Monitoring facility to protect the processor package and the system from thermal failure.

v. The offered processor of server should be scalable, high quality, robust with efficient performance.

vi. Each server of software compression solution should be designed with 85 percent (Max.) CPU loading with all filters enabled.

15/5/25

vii. CPU of server shall be similar to Intel Xeon Gold series/AMD EPYC 3rd Generation Series or better and launch date of CPU of server should not be prior to year 2021.

viii. Facility to store the last configuration in the network hardware so that in case of failure of the Compression System Control Computer, the system remains running and continues to Statistically multiplex two or more programme as per the last good configuration.

b) Hardware Feature:

Sl. No.	Parameter	Specification
A	**Performance of Central Processing Unit**	
1	No. of Core	24 (Min.) per CPU
2	No. of Thread	48 (Min.) per CPU
3	Processor Base Frequency	2.60 GHz or better
4	No. of CPU	One or more
B	**Memory Specification**	
5	RAM	DDR4 or better, 64 GB or more
6	Storage Memory	SSD, 240 GB (Min.) in Raid 1 Configuration
C	**Operating System**	
7	Operating system	Linux
D	**Ethernet Network**	
8	No. of Ports (Duplex) in server	i) Two nos. of 1 Gigabit port for Input or more ii)Two nos. of 1 Gigabit port for Output or more iii) Two nos. of 1 Gigabit port for Management & Control iv)Two nos. of 1 Gigabit port for Ancillary services
E	**PCI slot**	
9	PCI slot	2 nos. or more
F	**Operating Environment**	
10	Operating Temperature	10 to +35 °C
11	Humidity	10% to 90% non-condensing

5.2.3 Specification for IP Data Switch

A. Features

(i) Multicast IP routing, and access control list of connected hardware

(ii) Redundant swappable Power System for protection against power supply failures.

(iii) IEEE 802.1/w Rapid reconfiguration of Spanning Tree, and IEEE802.1s Multiple VLAN instances of spanning Tree.

(iv) IEEE 802.1x support for dynamic, port-based security, providing user authentication, MACSEC security.

(v) Real-time network fault analysis with easy-to-deploy device specific best-practice templates.

15/05/25

(vi) The required hardware and software including their licenses shall be provided for Multicast IP Routing, VLAN configuration and GUI of the switch for configuration and Monitoring of IP ports through Compression NMS.

(vii) The required Hardware & associated accessories (Cable with Connector) and software including their licenses shall be provided for stacking of the all IP Switches.

B. Specification

Sl. No.	Parameter	Specification
A	**Performance**	
1	Forwarding rate	72 Mpps (100 MBps) or better
2	Memory:	
i	DRAM	4 GB (Min)
ii	FLASH	2 GB (Min)
3	Maximum 10/100/1000 Ethernet ports (Selectable)	a) 48 (Min) for 48 Port IP Data Switch b) 24 (Min) for 24 Port IP Data Switch
4	Switching capacity	a) 176 Gbps(Min) for 48 Port Data Switch b) 128 Gbps (Min) for 24 Port Data Switch
5	Throughput	72 Mpps(Million packets per second) or better
6	IPv6 support	in software
7	Uplink optics type	4 SFP (Min 10 GB per SFP port) with single mode SFP Modules (Optical device/Cartridge)
8	CPU	800 MHz (Min)
9	Shared buffer	12 MB (Min)
10	Height of IP Switch	1 RU
B	**Indicators**	
11	Per-port status LEDs	link integrity, disabled, activity, speed, and full-duplex indications
12	System-status LEDs:	Fan, power and system Indicator

5.2.4 Specification for Enterprise Grade Next Generation Firewall System-

A General

1) The firewall system shall support point to point streaming (Upload and download) of radio and TV channels (Minimum 200 Channels) and Data services. It also support to integrate Ddos or similar Security system in future.
2) The OEM shall provide the login credentials with highest level of permissions to raise the technical issues in the name of Prasar Bharati, search knowledgebase, download the patches and upgrades, documents and manage the device on OEM sites. The successful Bidder must provide the login credentials.
3) OEM shall provide guarantee/warrantee, supports, Upgrades and latest OS versions, Updates/signature, Patches and Fixes as per terms and conditions of the tender.
4) The appliance should not have any active internal or external Wi-Fi component.

B Technical Specification-

1) The proposed firewall solution/platform shall run on a hardened OS and delivered on purposeful built hardware and security appliance.
2) Firewall Appliances shall be rack mountable and rack mount kit shall be supplied along.
3) The OEM shall provide the Solution/platform having features and licenses for Firewall, IPS, Site to Site VPN, Granular Application control, Anti-Malware, IPS, DNS Security, Identity Awareness and Anti-Bot on same platform/appliance managed through a centralized management console as per terms and conditions of the tender.
4) Solution/platform shall support Application level and "Stateful" policy inspection technology to prevent traffic leakage. It shall also have application intelligence for commonly used TCP/IP protocols like telnet, ftp, http, web 2.0 application etc.
5) The proposed security platform shall be supplied, installed and configured in 1+1 redundancy.
6) Firewall Appliance/platform shall provide high availability in Active- Active/Active-Passive mode. Appliance failover shall be completely stateful in nature without any manual intervention and should be completely transparent to end-user without any session drops.
7) Appliance/platform shall not require any downtime/ reboot for failover & backup purpose.
8) Firewall OS, CVE (Common Vulnerabilities and Exposures) must be available/disclosed on public web sites
9) It shall be possible to centrally manage Firewall and all the associated modules/ functionalities/ services over secure channel.
10) The solution/platform shall be supplied with the support for static and dynamic routing protocols.
11) The solution/platform shall support VLAN tagging (IEEE 802.1q).
12) Solution/platform shall have inbuilt integration with Identity Awareness Capabilities without any external devices. Integration shall work with/without any agent on the remote side.
13) Solution/platform shall support Application awareness and granular control functionalities for all the commonly available Web 2.0 applications and tools.
14) Solution/platform shall provide IPv4 and IPv6 support and must have IPv6 ready/USGv6 standard certification.
15) Solution/platform shall support Link aggregation functionality to group multiple ports as single Channel.
16) Solution/platform shall not have any licensing restriction on number of users and shall be supplied for unlimited users .
17) Solution/platform shall support site-to-site, Remote Access IPsec VPN & SSL VPN functionality. Proposed solution must include 100 IPSEC/SSL VPN user license .

C Performance Requirements

1) The Solution/appliance shall have Threat Prevention throughput of at least 2 Gbps with Application Control, FW, IPS , Anti-malware/Anti Virus, Antibot & URL/web protection/Filtering with logging enabled in Enterprise Mix / Application Mix traffic and scalable upto 5 Gbps to meet future requirements without replacing the existing hardware.
2) The platform/appliance shall have Next Generation Firewall throughput of at least 5 Gbps with Application Control, FW & IPS , with logging enabled in Enterprise Mix / Application Mix

Himanshu Goel 15/05/25

traffic and scalable upto 10 Gbps to meet future requirements without replacing the existing hardware.

3) The platform/appliance shall have Firewall throughput of at least 12 Gbps.
4) Proposed appliance/platform shall support at least 1.5 million concurrent sessions and minimum 85,000 new connections per second and should be scalable to handle additional requirements without replacing the existing hardware.
5) Solution/platform shall have minimum following ports:- 8 usable 1 Gig interfaces SFP/Copper- 4 usable 10 Gig SFP+ Interfaces with SR transceivers- Separate & Dedicated 1 x 1G port for out of band management- Separate & dedicated port for HA connectivity or Option to provide additional port for HA connectivity-Console, USB, Integrated network management ports (Min 1 each)
6) Proposed appliance/platform must have integrated redundant power supplies
7) The proposed NGFW appliance/platform architecture should have Control Plane separated from the Data Plane whereby Control Plane should handle Management functions like configuration, reporting & Data Plane should handle Signature matching, Security processing & Network Processing .
8) The proposed solution/platform hardware should be a multicore CPU architecture with a hardened 64-bit operating system to support higher memory and should have minimum of 32 GB of RAM.
9) The proposed platform must have minimum 1*240 GB SSD (RAID-1) of Storage i.e. proposed platform must have minimum one set SSD in Raid-1 configuration and the capacity of each SSD must have minimum 240 GB.

D Network Protocols/Standards Support Requirements

1) Solution/platform shall support the deployment in Routed as well as Transparent Mode.
2) Must support Static, RIP, OSPF, OSPFv3 and BGP.
3) The proposed firewall/platform shall have facility to handle unknown /unidentified applications with actions like allow, block or alert , without any limitation or upgradation by way of hardware or software licenses.
4) The proposed firewall/platform shall have granular application identification technology based upon deep packet inspection.
5) The proposed firewall/platform shall warn the end user with a customizable page when the application is blocked.
6) The proposed firewall/platform shall delineate specific instances of instant messaging/Social Network Applications (Facebook Chat,WhatsApp,Telegram,WeChat etc.).
7) The proposed firewall/platform shall delineate different parts of the application such as allowing Facebook chat but blocking its file-transfer capability.
8) The Firewall/platform shall provide stateful engine support for all common protocols of the TCP/IP stack.
9) The Firewall/platform shall provide NAT functionality, including dynamic and static NAT translations.
10) Firewall/platform should have creating access-rules with IPv4 & IPv6 objects wise, user/groups wise, application wise, application wise geolocation control, url wise, zone wise, vlan wise, etc.

11) Should have more than pre-defined 3000 distinct application signature (excluding custom application signatures) as application detection mechanism to optimize security effectiveness and should be able to create new application categories for operational efficiency

12) Solution/platform modules shall support authentication protocols like RADIUS/ TACACS+ etc.

13) Proposed platform must provide zero day attack protection with Anti-APT appliance/ cloud anti-apt/sandbox integration without any limitation or upgradation by way of hardware or software licenses.

14) **a.** Network address translation (NAT) shall be supported so that the private IP addresses of hosts and the structure of an internal network can be concealed by the firewall.
b. Network Address Translation (NAT) shall be configurable as 1:1, 1: many, many: 1, many: many.
c. Reverse NAT shall be supported.
d. Port address translation /Masquerading shall be supported.

15) Dynamic Host Configuration Protocol (DHCP)& Virtual Private Network (VPN) shall be supported

16) **a.** The firewall/platform shall support Internet Protocol Security (IPsec).
b. Key exchange with latest Internet Key Exchange (IKE), Public Key Infrastructure PKI (X.509) shall be catered to.
c. Support Latest Encryption algorithms including AES 128/192/256(Advanced Encryption Standards), 3DES etc.
d.Support Latest Authentication algorithms including SHA-1(Secure Hash Algorithm-1), SHA-2(Secure Hash Algorithm-2) etc.
e. IPsec NAT traversal shall be supported.

E **Firewall Policy Requirements-**

1) Firewall//platform shall be able to configure rules based on the following parameter --
   a) Source/Destination IP/Port/Geo locations
   b) Time and date access
   c) User/group role (After Integration with AD)
   d) Customizable services
   e) Combination of one or multiple of above mentioned parameters
2) The Firewall/platform shall be able to filter traffic even if the packets are fragmented.
3) It shall support the VOIP Applications Security by supporting to filter SIP, H.323, MGCP etc.
4) Firewall/platform shall support Access for Granular user, group & machine based visibility and policy enforcement. It shall have following features:
5) **a)** The firewall/platform shall mask/NAT the internal network from the external world.
   b) Multi-layer, stateful, application -inspection-based filtering shall be supported.
6) **a)** It shall provide network segmentation features with capabilities that facilitate deploying security for various internal, external and DMZ (Demilitarized Zone) sub-groups on the network, to prevent unauthorized access.
   b) Ingress/egress filtering capability shall be provided.
   c) There shall be support for detection of reconnaissance attempts such as IP address sweep, port scanning etc.
   d) Basic attack protection features listed below but not limited to :
   i) Maximum no of protections against attacks that exploit weaknesses in the TCP/IP protocol suite.

ii)It shall enable rapid detection of network attacks
iii)TCP reassembly for fragmented packet protection
iv) SYN cookie protection , SYN Flood, Half Open Connections
v) DoS/DDoS Protection
vi) Protection against IP spoofing
vii) Malformed packet protection

F Application Control Feature Set-

1) Should be capable of dynamically IPS policies/Profiles (e.g., selecting rules, configuring policies, updating policies, etc.) with minimal human intervention.
2) Should have more than 10,000 (excluding custom signatures) IPS signatures or more.
3) Should be capable of automatically providing the appropriate inspections and protections for traffic sent over non-standard communications ports.
4) Should be able to link Active Directory and/or LDAP usernames to IP addresses related to security events.
5) Solution must have IOC management / IP/URL reputation intelligence feeds from native/third party and custom lists of IP addresses including a global blacklist.
6) The Appliance OEM must have its own threat intelligence analysis centre and should use the global footprint of security deployments for more comprehensive network protection without any integration with 3rd party.
7) Enforce policy on individual users and user groups: Policy to allow or deny certain types of traffic must be enforceable on individual users or user groups.
8) User-developed application & IPS signatures: The application control & IPS function shall allow to create new application & IPS signatures.

G Anti-APT (Zero Day Protection)-

1) The Proposed NGFW must support the integration with On-Prem Anti-APT devices or cloud based anti APT/sandboxing . The NGFW and Anti-APT device must be provided by same OEM to have tight integration to prevent from unknown attacks.
2) The unknown malware analysis service should provide a guaranteed protection signature delivery time not more than 5 minutes. The cloud based ATP solution must have Indian based threat data lake which should be leveraged for threat resolution. Cloud base unknown malware analysis service should be certified with SOC2 or any other reputed Data privacy compliance certification for customer data privacy protection which is uploaded to unknown threat emulation and analysis.
3) The Anti-Apt solution and Firewall should be able to managed from a single Management server/console or central Management server/console to have a holistic view/reporting of threat vectors.
4) The Anti-APT solution must monitor for suspicious activity in: API calls, File system changes, System registry, Network Connections, System processes, File creation and deletion, File modification, Kernel code injection , Detect Privilege escalation attempts, Kernel modifications (memory changes performed by kernel code, not the fact that a driver is loaded - this is covered by the item above), Kernel code behaviour (monitor activity of non user-mode code), Direct physical CPU interaction , UAC(user access control) bypass detection. Further the Anti-APT solution must do Dynamic analysis, Static analysis and use Machine learning to identify new malware, which is not analyse with static or dynamic analysis.

5) The threat inspector/sandboxing (On-Prem/Cloud Based) proposed must be able to process at least 1000 unique malicious files per day from day-1.
6) The solution must support larger file sizes to have tighten protection against unknown files or system should be able to support file sizes up to 100 MB or more.

H Administration, Management , Logging & Reporting-

1) Solution must have tracking mechanism for the changes done on policy management dashboard and maintain audit trails.
2) The management platform shall be supplied, installed and configured in HA mode, if offered as standalone unit. Whereas, If management platform is inbuilt with Firewall unit, both offered firewall units must be identical, have management platform and configured in HA mode..
3) Proposed management platform must have integrated redundant power supplies
4) The Firewall Management Solution , log server and reporting server can be either hardware appliance or VM based solution or can be on the firewall itself with feature parity of a dedicated central management server.
5) In case of VM based management solution, VM infrastructure will be provided by bidder/OEM. will provide VMware based infrastructure for hosting the management solution including storage & compute . Further all other third party licenses including OS, software components, databases etc. for running the solution shall also be provided by the bidder for the entire duration of the project. All licenses shall be Enterprise class. The bidder has to provide required licenses in case of any upgrade/change of any component of the whole solution during warrantee period. Solution has to be configured by the bidder to cater to smooth operation of the whole solution. Solution should be scalable to use more storage and compute if required.
6) The Solution shall receive logs for the overall proposed solution in a single virtual system, and shall not be separate for each module of proposed firewalls. All the logs shall be stored for 90 days (minimums 450GB @ 5GB per day for storage of log files) with all features and policies enabled. The sizing of the disk space has to be done accordingly.
7) The management platform must include an integration mechanism, preferably in the form of open APIs and/or standard interfaces, to enable events and log data to be shared with external network and security management applications, such as Security Information and Event Managers (SIEMs), and log management tools.

5.2.5 Specification for IP Router

A. General Features

(i) IP Router shall support broadband and leased line access for delivering any services (i.e. Audio, Video, data etc) to encoding System

(ii) IP Router shall have dual redundant hot swappable Power System for protection against power supply failures.

(iii) IP Router shall be scalable by providing additional hardware and software in future.

(iv) IP Router shall have Network Address Translation (NAT) facility to mask the IP Addresses & ports of the host to another IP address & ports.

(v) IP Router shall support both Encryption and non-Encryption streaming.

15/05/25

(vi) IP Router shall offer service flexibility and deliver Layer 2 VPN and Layer 3 VPN and Multicast services.

(vii) It shall have inbuilt firewall with port blocking facility to support IP security to protect against vulnerabilities to subscriber traffic and network.

(viii) The required hardware and software including their licenses shall be provided on perpetual basis for Multicast IP Routing, NAT, VLAN, Tunneling configuration and GUI of the Router for configuration and Monitoring of all IP ports.

B. Technical Specification

Sl. No.	Parameter	Specification
A	**Performance**	
1	CPU	4 core or better
2	Memory:	
i	DRAM	8 GB (Min)
ii	FLASH	8 GB (Min)
3	Ports:	
i	No. of IP port	Minimum 8 Nos, Full-Duplex
ii	Details of IP port	(i) Minimum 4 x 1 Gigabit Ethernet (RJ 45) and (ii) 4x10 GE Small Form-Factor Pluggable (SFP+) with hardware device/module
4	Network Address Translation session	Minimum One million
5	Supporting Protocol of IP Router	IPv4, IPv6, static routes, Routing Information Protocol Versions 1 and 2, Multicast Internet Group Management Protocol Version 3 (IGMPv3), DHCP, HSRP, IPv4-to-IPv6 Multicast, MPLS, Layer 2 and Layer 3 VPN, IP sec, Layer 2 Tunneling Protocol Version 3, MACSEC etc
6	Aggregate Throughput	10 Gbps or better
7	Height of IP Router	1 RU or 2 RU
B	**Indicators**	
8	Per-port status LEDs	Link integrity, disabled and activity indications
9	System-status LEDs:	Fan, power and system Indicator

5.2.6 IP Encapsulator cum Multiplexer Specifications

A. Features:

i) Each IP Encapsulator cum multiplexer shall be capable of multiplexing minimum of 64 SDTV services or 20 HDTV services or combination of both SD & HD service + 8 Radio channels (only in CBR) with DVB-CSA (V-1 & V-2) supported DVB-CAS simulcrypt encryption through IP and ASI in CBR and/or VBR mode inputs per transport stream. It should have the facility for statistical Multiplexing, scrambling, De-multiplexing and again multiplexing the relevant/required services.

ii) The Compression system (Either IP Encapsulator cum multiplexer or Encoder) should be able to create independent as well as combination of pool of services mux in

Himanshu Goel 15/5/25

statistical & CBR for MPEG 2, H.264/MPEG 4 and H.265/HEVC Compressed streams of SD & HDTV channels.

iii) Each IP Encapsulator shall have enabled minimum four independent IP data port (Bi-directional), one IP port for DVB-CSA (V-1 & V-2) supported DVB-CAS with simulcrypt encryption & four independent ASI input port and four independent ASI output port, so that IP Encapsualtor shall be able to take input stream/signal through IP as well as ASI port for multiplexing the channels and take out multiplexed transport stream through IP on RJ 45 as well as ASI on BNC/HD BNC/Micro BNC port.

iv) Each IP Encapsulator shall generate four independent ASI output transport stream with DVB-CSA (V-1 & V2) supported DVB-CAS simulcrypt Encryption(CAS) for transmission with option of generating ASI output transport stream without DVB-CAS encrypted (free to air) for monitoring of this set up.

v) Each IP Encapsulator should be capable to multiplex both SDTV and HDTV signal simultaneously with DVB-CSA (V-1 & V-2) supported DVB-CAS simulcrypt encrypted ASI output as well as without DVB-CAS encrypted (free to air) independent ASI transport output for monitoring.

vi) It should be possible to include any HD encoder part of any mux pool and transport stream irrespective of its physical location at IP switch and Route any service through any Input to any output.

vii) IP Encapsulator should be capable to accept variable video bit rate Programme Stream and Multiplex the multiple streams in a multiple Multiplexing Group i.e. "n x services" and allocate optimum bit rate to the services in the Transport Stream.

viii) The multiplexer shall be capable of transmission of broadcast data signals along with video and audio.

ix) IP Encapsulator should have DVB compliant for encapsulation of EPG data, DVB-SI/PSI table, NIT table, EMM table, ECM table generated by EPG and DVB-SI/PSI Generator/Server and CAS server in the output of transport streams.

x) Each IP Encapsulator cum Multiplexer unit should have Hot swappable dual redundant SMPS Power Supply.

B. Technical Specification

Sl. No.	Parameter	Specification
a)	**IP data Port Specifications**	
1	Type	Gigabit Ethernet 802.3z
2	No. of Ports for Input and Output data	(i) Minimum four Nos. physical independent 1 Gigabits RJ 45 ports (Bi-directional) with licenses (2 ports for Input & 2 ports for output configurable) (ii) Minimum four Nos. physical independent 10 Gigabits SFP ports (Bi-directional) with SFP Optical Device Cartridge
3	I/O Speed	Min 900 Mbps per port

4	IP Encapsulation	MPEG -2 TS over IP
5	MPEG Format	188 B per TS
6	Addressing	Unicast and Multi cast (at a time only one).
7	Ethernet Interface	1000 base T
8	No of Ports for Ancillary Data	Min. 2 Nos. physical 1 Gigabit RJ 45 port (Bi-directional).
9	Ethernet Control and Management connector	Min. 1 no RJ 45 1 Gigabits for control and management
b)	**DVB-ASI Transport Stream Input Specifications**	
1	Format	MPEG-2 TS/ DVB-ASI
2	Quantity	Minimum 4 independent ports
3	Connector	BNC/HD BNC/Micro BNC; Female
c)	**DVB-ASI Transport Stream Output Specifications**	
1	Format	MPEG-2 TS/ DVB-ASI
2	Quantity (No. of o/p Port)	Minimum Four Independent ports configurable to DVB-CSA (V-1 & V-2) encryption for transmission. These ports shall also be enabled to simulcrypt minimum two DVB-CAS encryption and configurable to free to air mode for monitoring.
3	Transport Stream output	100 Mbps per Output Stream
4	Connector	BNC/HD BNC/Micro BNC; Female
d)	**DVB-CSA (V-1 & V2) supported simulcrypt DVB-CAS Feature**	
1	IP Port for DVB-CSA V-1 & V-2 supported DVB-CAS Control with required licenses	Minimum one port (RJ-45)
2	No. of DVB-CAS to be simulcrypt	Minimum two CAS
3	Name of CAS to be deployed	Generic Conditional Access System (CAS)
4	IP data port for OTA with required license	Through IP data port or ASI port
5	Scrambling Feature with required licenses	On all independent output port with each service and ON-Off facility.
6	EMM processing bandwidth	4 Mbps or better
7	ECM processing bandwidth	15 kbps or better per channel
e)	**Operating Environment**	
1	Operating Temperature	10 °C to +35°C
2	Humidity	10% to 90 % Non-Condensing

C. **Statistical Multiplexing:**

(i) There should be Statistical Multiplexing software to enable Doordarshan to control the configurations of each channel encoder in order to optimize the bit rate used to encode the video material.

(ii) The statistical Multiplexing shall essentially have following feature:-

a. User selectable minimum & maximum bit rates per channel.

b. Provision for linear bit rate changeover on frame by frame basis as per specified bit rate of each channel.

c. There shall be no break in service during change of bit rate of compression equipment and also during transition to redundant IP Encapsulator cum Multiplexer. There shall be no requirement of rebooting of the compression equipment for effecting the change in configuration.

d. Real time bit rate management for continuous allocation of bandwidth between the encoders using only native hardware and software of encoders and multiplexer i.e. without the use of any additional / external computer hardware or software.

e. Stat Mux facility should support among all SDTV & HDTV channel with DVB-CSA (V-1 & V-2) supported simulcrypt DVB-CAS encryption (CAS).

f. Fast response to the variations as per the complicacy of the source material.

g. Enabling of statistical Multiplexing shall not need any change in the hardware or software of the receiving equipment i.e. STBs.

D. **Implementation of DVB-CSA (V-1 & V-2) supported DVB-CAS, EPG, Video on Demand (VoD), NVoD, Subtitling, Audio descriptor, closed captioning etc.**

Services like DVB-CSA (V1 & V-2) supported with simulcrypt DVB-CAS encryption (CAS), Subtitling, Audio descriptor, EPG etc will be carried by the DD FreeDish platform and the equipment offered by the bidder shall be capable of carrying these services without any limitation or requiring upgradation by way of hardware and software. The offered IP Encapasulator cum multiplexer shall also be Video on Demand (VoD) & NVoD with .TS format compliant, however Storage server, Playout system, GSM or IP based network for return path are not in the scope of this tender.

5.2.7 Specification for Bi-directional SRT based Gateway System –

A. **General Feature**

(i) Bidder shall supply, install, test and commission (SITC) Server Based Bi-directional SRT based Gateway System to Send & receive eight No. MPEG transport streams from DD FreeDish (DRC) Hyderabad to DD FreeDish (Main) Todapur Delhi and vice versa. Internet Connectivity between DD FreeDish (DRC) Hyderabad and DD FreeDish (Main) Todapur Delhi will be provided by Doordarshan.

(ii) It shall consist of one set of SRT based Gateway Sender System in (1+1) configuration, dedicated to send eight numbers of MPEG transport streams, and one set of SRT based Gateway Receiver System in (1+1) configuration, dedicated

to receive eight numbers of MPEG transport streams, to be installed and commissioned at DRC Hyderabad (Please see Drg No. 4).

(iii) Similarly, one set of SRT based Gateway Sender System in (1+1) configuration, dedicated to send eight numbers of MPEG transport stream, and one set of SRT based Gateway Receiver System in (1+1) configuration, dedicated to receive eight numbers of MPEG transport stream, to be installed and commissioned at DD FreeDish Earth station Todapur Delhi (Please see Drg No. 4).

(iv) The Gateway System shall provide reliable SRT-based connection between two sites: the Main site (DD FreeDish (Main) Todapur Delhi) and the Disaster Recovery site DD FreeDish (DRC) Hyderabad site.

(v) The purpose of this SRT based Gateway System is to ensure seamless video delivery with redundancy, allowing uninterrupted service even during hardware or network failures of either sites.

(vi) The SRT based Gateway System shall be used to Send & Receive eight number MPEG transport stream between DRC Hyderabad and ES Todapur (Delhi), in any combination with customisable re-Multiplexing feature.

(vii) The sender gateway at Hyderabad shall take MPEG-2 TS/ASI signal from the output of IP Encapsulator cum Multiplexers through MPEG-2 TS over IP on RJ 45 through IP data Switch as well as ASI on BNC/HD BNC/Micro BNC port through ASI Router patch panel. It shall take either all or some MPEG-2 TS/ASI signal as per site requirement and will send it to DD FreeDish Earth station Todapur Delhi, where it is received by receiver Gateway and vice versa.

(viii) The Receiver Gateway will provide the same MPEG-2 TS over IP on RJ 45 as well as ASI on BNC/HD BNC/Micro BNC port for Modulator system without any distortion like errors, packet loss etc, and shall have minimum latency. This MPEG-2 TS/ASI shall be used by Modulator at the site of receiver Gateway whenever required.

(ix) It shall provide support for upgrade without any disruption to network traffic both for Input and Output SRT streams.

(x) SRT Gateway should Supports Caller, Listener for establishing SRT connections.

(xi) SRT Gateway should support Point to point Connection and Point to Multipoint Connection.

(xii) The Client support to per SRT stream -- 10 (minimum)

(xiii) SRT Gateway shall support following AES encryption and decryption mode i.e.; AES-128, AES-192 and AES-256 (user selectable).

(xiv) SRT Gateway shall have intelligent packet retransmission mechanism for recovering lost packets, ensuring reliable transmission over unreliable networks.

(xv) SRT gateway should support FEC (Forward Error Correction).

(xvi) SRT gateway should support adjustable Low Latency Optimization. . This parameter can be set from 100 to 5000 ms.

(xvii) SRT Gateway shall have Metadata Pass-through. It should supports Closed Captioning (EIA-608/708), DPI PIDs, PSI/SI and ECM/EMM PIDs.

(xviii) SRT Gateway shall have PID Remapping, PID pass/Block configuration support.

(xix) SRT Gateway shall have hostname Support. It should supports both IP addresses and Fully Qualified Domain Names (FQDNs).

(xx) SRT Gateway shall have Web GUI Control - HTTPS-based interface for configuration, management, and monitoring of the SRT gateway.

(xxi) SRT Gateway should support the rest API for Enables control and integration with other systems.

(xxii) The hardware configuration is suggestive and minimum and actual offer should be based on the requirement of system while server shall not be loaded more than 70%.

B. Technical Specifications

Sl. No.	Parameters	Specification
1	Input	i. DVB ASI on BNC/HD BNC/Micro BNC (75 ohm) port ii. MPEG-2 TS over IP on RJ 45
2	Output	i. DVB ASI on BNC/HD BNC/Micro BNC (75 ohm) port ii. MPEG-2 TS over IP on RJ 45
3	Hardware Configuration (min)	i. Server based Intel or AMD CPU, ii. Generation launch date not older than 2021, iii. 3.0 GHz (min.), iv. 16 core CPU (min.), v. 128GB RAM (min.), . RAID 1, vi. minimum 250 Gb Hard drive
4	Operating System	Linux
5	TS Bitrate	2 Mbps to 100 Mbps per TS
6	Number of Transport Stream	8 (min.)
7	Number of TV Channels	300 (min.) depending upon bit rate.
8	Bit Rate	0.5 Mbps to 8 Mbps per TV Channel depending upon compression standard and resolution.
9	Throughput	1GB (min) (as per site requirement)
10	Remote Management/Input/output	Minimum Six ports for Device Management, Input and output with Port redundancy
11	Management & Monitoring	Web GUI Control

5.2.8 Specification for 16x16 or better matrix SDI/ASI Routing Switcher

A. General:

The equipment should be very reliable and able to be used for selection of any one of the ASI/ SDI input signals to all destinations. The equipment so offered should be for professional Broadcast applications. The Router has to be quoted with X-Y and Single Bus control panels.

B. Essential Features:

i. The routing switcher electronics should be capable of being mounted in a standard 19" rack frame.
ii. The switcher shall handle SDI/ ASI signal for routing from input to output destinations. The switching should take place during the vertical interval period with re-clocking.

iii. The switcher should have storage facilities for control information, so that in case of power supply failure, the status of the switcher output should remain unchanged when the power supply is restored.
iv. The switcher should have a built in Auto-Switchable redundant dual power supply.
v. The switcher quoted against this specification should be complete in all respects and should have the desired features.
vi. A certificate from Compression OEM regarding compatibility with compression is required to be submitted alongwith the bid.
vii. Any of the input shall be capable of being switched to any or all outputs of router.
viii. Number of input and output port of ASI/SDI Router shall be same.

C. Technical Specification:

Sl. No.	Parameter	Specification
1.	Matrix size	16x16 or better matrix
2.	Input	SDI/ASI (BNC/HD-BNC 75 ohms)
3.	Equalization	Automatic: 150 Meters at 270 Mbps.
4.	Output	SDI/ASI (BNC/HD-BNC 75 ohm)
5.	Return Loss	≥ 15 dB on data rate up to 270 Mb/s throughout the switching chain.

5.2.9 Compression System Control Computer with Software

A. Compression System Management Functions

(a) The compression system control computer shall control the operation, redundancy switching and configuration of all parameters of encoders, IP Encapsulator cum multiplexers, SDI & ASI routers and IRDs including alarm and fault logs for a minimum of 365 days or configurable to 90/120/180 days subject to limitation of hard disk space.

(b) The NMS (Compression control system) offered should be capable to mux 64 TV channels (min) per mux group. However, there should not be any restriction on total number of streams.

(c) NMS shall have the facility to configure, control and monitor minimum 75 equipment/elements like IRDs, Encoders, IP Encapsulator cum Multiplexers, SDI Router, ASI Router, RCPs, IP Switches etc.

B. Salient Features:

The System Control Computer shall be used as a control protocol to configure the various parameters for the statistical multiplexing such as:

i. To configure encoders for variable Bit Rate Transport Stream. Setting of minimum and maximum limits of data rate for each encoder.
ii. To configure GOP pattern for frame-by-frame encoding. Encoding should take place at the encoder in real time.
iii. If the System Control Computer fails or powered down, the whole system should be failure protected so that it still works.

iv. Facility to store the last statistical Multiplex configuration in the network hardware so that in case of failure of the Compression System Control Computer, the system remains running and continues to statistically multiplex two or more program as per the last good configuration.

v. To configure IRDs supplied by OEM to any pre-defined TV channels.

vi. There shall also be a facility to configure the encoders for pre-defined Image (PNG/JPEG, GIF/HTML format) on the loss of video input in NMS.

vii. There shall be facility to create ghost backup of hard disk of NMS computer on USB storage.

viii. Each set of Network Management System (NMS) shall comprise of either (1+1) rack mounted server for 24x7 operation in master and slave configuration or in cluster configuration with minimum 3 servers for high availability (HA); along with four client licenses.

ix. There shall be four client PCs with required licenses and 21 inch or better size display monitors along with each PC for monitoring of all 8 sets of NMS system from remote locations.

x. These client PCs shall be installed in Compression room, Monitoring room, shift in-charge room and supervisor room. An Ethernet connection required to be provided on the all client PCs.

xi. The Compression Control Computer (NMS) should be capable of controlling and monitoring all parameters of the digital video and audio compression system through suitable hardware interface and user friendly GUI.

xii. To facilitate centralized network management operations in future, it should be possible to operate the system remotely via a suitably configured computer and Broadband network. It should be supplied with complete hardware and software to interface all the equipment in the chain for their proper control and monitoring.

xiii. The complete compression NMS software of each set is to be loaded on a single control computer/server with networking facilities if offered in master and slave mode, whereas compression NMS software of each set is to be loaded on two control computer/server with networking facilities in cluster mode.

C. Required Hardware and Software

The compression system control computer shall be based on industry standard, open system hardware and software that will provide a user-friendly GUI to the operator.

Sl. No.	Parameter	Specification
1	Man Machine Interface	Graphical User Interface (GUI)
2	Operational Features	Based on latest Windows / Linux version: (a) Diagnostic log (b) Transaction log (c) Password privilege system (d) Dial in modem support/Through Broadband (e) Multi user terminal support
3	Physical Connection to Equipment	Ethernet 10 Base-T/100 Base-T through CAT 6 or better cable
4	Hardware Platform	Supplier to provide full details of the industry standard hardware platform proposed

5	Software	Supplier to provide full details of the industry standard software platform proposed
6	Back up on USB storage	The back up/ recovery USB storage for all the software are to be provided with proper licenses.
7	No of Equipment/Element to be controlled by each offered Compression NMS	75 Nos. (Minimum)
8	Storage Memory	SSD, 240 GB (Min.) in RAID 1 Configuration
9	**Operating Environment**	
i	Operating Temperature	10 °C to +35°C
ii	Humidity	10% to 90 % Non-Condensing

D. Remote Access

It shall be possible to add a remote user terminal and modem/IP interface to provide access to the control system computer from a remote location via Broadband network. The remote user shall have access to all the commands available at the main control system, subject to password restrictions for security. The remote user shall be presented with a user interface. which is identical to the local user interface.

5.2.10 EPG and PSI/SI Generator/Server

A. General :

(i) EPG and PSI/SI Generator/Server shall comprise of (1+1) Rack mounted server in redundant configuration for 24x7 hrs operation. All the Software and hardware for EPG and PSI/SI Generator functionality shall be included in the offer.

(ii) There should be provision to insert Electronic Programme Guide for TV channel and private Data in the output transport streams of Multiplexer including DVB Actual and DVB Other signaling (cross-Compilation).

(iii) DVB-SI standard and private descriptors shall also be supported.

(iv) The PSI/SI System shall generate DVB-SI in compliance with ETSI EN 300 468 Digital Video Broadcasting.

(v) The server shall generate DVB compliant Program Specific Information (PSI) and Service Information data for multiple transport stream over ASI and IP interface i.e. the system should support external Data/ASI stream and TS over IP multicast & Unicast stream as input to the multiplexer.

(vi) EPG and PSI/SI generator/server shall generate DVB Compliant Tables namely PAT, CAT, BAT, PMT, NIT, SDT, TDT, TOT, EIT-PF, EIT scheduler, etc.

(vii) EPG Generator shall have the facility for EIT scheduler of minimum 7 days for 175 TV channels in multiple Transport stream i.e. minimum six transport stream with mirror output.

(viii) It shall support management of Logical Channel Numbers and private data of conditional Access System (CAS) in simulcrypt mode.

(ix) The PSI/SI System shall validate the ingested schedule files and shall be user configurable including PID filtering facility to pass PID of incoming Input to Output stream.

(x) The offered generator shall have the facility to analyse and monitor output transport stream on 24x7 hrs. basis.

(xi) The PSI/SI System shall provide export and reports of the services configuration in Excel and PDF format.

B. Technical Specification

Sl. No.	Parameter	Specification
1	Software	Software to Generate DVB compliant EPG and PSI/SI functions
2	Man Machine Interface	Graphical User Interface (GUI)
3	Operational Features of EPG and PSI/SI Generator	Based on latest Windows / Linux version: (i) DVB compliant PAT, CAT, PMT, SDT, BAT, NIT, EIT, TDT, TOT etc table (ii) Diagnostic log (iii) Password privilege system (iv) Web Browsing Through Broadband (v) Multi user terminal support
4	No of Ports	(i) 2 Nos. Bi-directional configurable data Port (RJ45) (ii) 2 Nos. Bi-directional configurable Management Port (RJ45)
5	Hardware	
a	No of CPU	Two or more
b	Processor Base Frequency	2.1 GHz or better
c	Storage Memory	240 GB (Min.) in Raid 1 Configuration
d	RAM	2x8 GB and above
e	Network card	4x NIC card of 1 GB or better
6	Back up on DVD ROM/USB storage	The back up/ recovery DVDs ROM/USB storage for all the software are to be provided with proper licensees.

5.2.11 Specification for Network Time protocol (NTP) Server

A. General

i. NTP server should be secured and reliable source of network time synchronization for broadcast application.

ii. NTP Server shall have front panel display and keypad for configuration.

iii. It should have Secure Web Interface for Configuration, monitoring of status, logs, etc via Internet browser

iv. It should have dual redundant power supply.

v. It should have also GPS based time synchronization facility consisting of necessary equipment and licenses.

15/05/25

B. Technical Specification

S. NO.	Description	Specification
1	Accuracy (GPS Locked)	5 microseconds per day ($5.79x10^{-11}$)
2	Type of Oscillator	Rubidium (Rb)
3	Network Timing Service	i) NTP V2, V3, V4 ii) SNTP V3, V4
4	Number of clients/devices to be synchronized	Minimum 2000
5	Mode of Operation	Unicast, Broadcast and Multicast
6	Network Input output port	Minimum two no. Gb Ethernet (RJ-45)
7	Management IP Protocol	IPv4/ IPv6 Compliant
8	Antenna Connector	SMA/N-type/TNC
9	Management Interface	RS-232 or 10/100/1000 Based-T Ethernet Port
10	Status Indicator	LED/OLED based
11	Size	19" rack mountable

5.3 Specification for Satellite Modulator & IF Redundancy Switch; IF to L band Up-converter, L band Redundancy Switch and HPA system:

5.3.1 Specification for Satellite Modulator

A. Essential Features

(i) The offered modulator shall be compact reliable and have state of art technology.
(ii) It should provide IF output (70 MHz) and L-band (950 to 1700 MHz) as per DVB-S and DVB-S2 standard's modulation schemes based on the user requirement.
(iii) The offered Modulator should have facility to auto equalization or pre-equalization to pre-distort signal before feeding to Up-converter based on feedback signal, so that downlink signal is kept within 36 MHz BW of the transponder. This should not affect the operation of the existing STBs (MPEG-2 &MPEG-4 and DVB-S& S-2).
(iv) The offered modulator should have front panel display. It should be possible to configure the modulators through front panel keys and through browser on remote computer.
(v) The offered modulator should be compliant to the ETSI 103 129 DVB Carrier ID (DVB-CID) requirement.
(vi) The offered Modulator will be used in 1+1 redundant mode of operation.
(vii) The redundancy of modulator may be controlled either through compression system NMS or it can work independently without the help of Compression System NMS.

15/5/25

B. Technical Specification:-

(I) Inputs

Sl.	Parameter	Specification
1.	**ASI Input**	
(a)	Compliance	DVB Document A010 rev. 1, May 1997:Section 4.4
(b)	Byte stuffing modes	Byte and single packet burst mode.
(c)	No. of Port	Mini. 2 Nos. with selectable to any of ASI Inputs
(d)	Connector	BNC, 75 Ohms
2.	**IP Data Port**	
(a)	Input Data Format	MPEG-2 TS over IP (RTP/UDP- SMPTE-2022)
(b)	No. of Port	Mini. 2 Nos
(c)	Speed	Mini. 1 Gbps
(d)	Connector	RJ-45

(II) Forward Error Correction and Modulation Scheme as per DVB-S standard

Sl.	Parameter	Specification
(a)	Multiplex Adaptation and Energy Dispersal	As per ETSI EN 300 421 (DVB-S)
(b)	Outer Coding	Reed-Solomon (204,188,T=8)
(c)	Interleaving Depth	12
(d)	Inner coding	(QPSK) Convolution : R=1/2, 2/3, 3 /4, 5/6 and7/8
(e)	Spectrum Roll off factor	20%, 25 % and 35% selectable
(f)	Modulation	QPSK
(g)	Transmission rates	Variable, 1.0 to 45M symbol/s (Min.)

(III) Forward Error Correction and Modulation Scheme as per DVB-S2 standard

Sl.	Parameter	Specification
(a)	Multiplex Adaptation and Energy Dispersal	As per EN 302 307 (DVB-S2)
(b)	Modulation	QPSK, 8PSK
(c)	Modulation mode	1. Backward compatible mode(DVB-S/ DVB-S2 one at a time) 2. Constant Coding and Modulation mode(CCM)
(d)	Outer Coding	BCH
(e)	Inner coding	LDPC R= 1/ 2, 3/5, 2/3, 3/ 4, 4/5, 5/6, 8/9, 9/10 (For DVB-S 2, QPSK), R= 3/5, 2/3, 3/ 4, 5/6, 8/9, 9/10 (For DVB-S2, 8PSK)

(f)	Spectrum Roll off factor	5%, 10%, 15%, 20%, 25% and 35% selectable
(g)	Transmission rates	Variable, 1.0 to 45 M symbol/sec (Min)

C. IF output Interface Specification:

Sl	Parameter	Specification
(a)	Output Frequency Range	70 ± 18 MHz
(b)	Frequency Stability of Internal 10 MHz clock with respect to Temperature	<± 2.5ppm over 0° to 50°
(c)	Output Impedance	75 ohms unbalanced
(d)	Connector	BNC, female
(e)	Output Return Loss	15 dB (min.)
(f)	Output Level Range	-20 to +0dBm
(g)	Level Step Size	0.2 dB max.
(h)	Spurious Outputs	≤ -55dBc/4KHz @ 0dBm or ≤ -60 dBm
(i)	Synthesizer Phase Noise	should meet the requirements of IESS-308
(j)	CW mode	Selectable
(k)	Noise floor (No/ C)	< -120 dBc/Hz

5.3.2 Specifications for IF Redundancy switch

A Essential Features:

i) IF redundancy switch is provided for switching between main and redundant modulator.

ii) The switch should be able to accept alarm signal from both main and redundant modulator for modulator redundancy.

iii) In case of failure of modulator in one chain, the switching system should be able to provide IF signal output from the healthy modulator.

iv) In case of failure of main / redundant chain audio and visual alarm should be generated to indicate the failure of main/ redundant modulator.

v) The offered IF redundancy switch should have dual redundant power supplies.

vi) Facility for automatic, Manual and remote (through web interface) switching of the modulators should be available through the IF Switch.

vii) The switch should have high reliability, robustness and should be of professional type.

viii) The offered Satellite Modulator and IF Redundancy Switch should be of same make so that both are compatible for providing the redundancy.

Himanshu Goel 15/5/25

B Technical Specifications

Sl. No.	Parameter	Specifications
i)	Operating frequency range	50 to 200 MHz
ii)	Insertion loss	≤ 3 dB
iii)	Isolation	
	a) Input to input	45dB min
	b) input to output	50dB min
iv)	Input return loss	13 dB min
v)	Output return loss	13 dB min
vi)	IF connector	BNC/SMA type
vii)	Impedance	75 Ohms
viii)	Remote control	RS232or RS422/485 or RJ 45

5.3.3 Specifications for IF to L band Upconverter:

A. Essential Features :

a) The IF to L band Up-Converter should be in 1+1 redundant configuration Hot-swappable with External or Internal Redundancy Controller.

b) In case of Failure of main Up-Converter, the L band Redundancy switch should be able to provide L band Output from the redundant unit through seamless and automatic switching.

c) In case of failure of main/redundant Up-Converter, alarm should be generated to indicate the failure of main/redundant Up-Converter.

d) Facility for Automatic, Manual and Remote (through NMS) switching should be available.

e) Each up-converter chassis should have one up-converter system with/without Redundancy Switch and should have its own power supply unit.

B. Technical Specifications :

Sl. No.	Parameters	Specifications
1.	Input Frequency	70 ± 18 MHz
2.	Output Frequency Range	950 – 1750 MHz
3.	Frequency Step Size	125 KHz

4.	Gain	20 dB (0.1 dB step size)
5.	Gain adjustment Step Size	0.1 dB (Max)
6.	Gain flatness	1.0 dB p-p max. for 40 MHz Transponder
7.	Gain stability	±0.25 dB max. /24 hours
8.	Input Return loss	18 dB minimum
9.	Output Return loss	15 dB minimum
10.	Input Impedance	75 ohms
11.	Output Impedance	50 ohms
12.	Input level Max (damage Level)	0 dBm
13.	Output Power (1dB compression Point)	+0 dBm (min.)
14.	Phase Noise	IESS 308/309 compliant or Better
15.	Spurious	-55 dBc carrier related -60 dBm Non carrier related
16.	Input Connector	BNC (F)/SMA
17.	Output Connector	N Type (F)/SMA
18.	Remote Control	RS232 or RS422/485 or RJ 45 or any other port. This should be connectable to LAN using required format converters.
19.	Manual Control	Front Panel with Fault LEDs
20.	Switching	Auto and Manual
21.	Operational Temperature	0°C to +50°C
22.	Storage Temperature	-55°C to +70°C

5.3.3.1. Technical Specification of L - Band Combiner:

A. Essential Features :

a) The offered L - Band Combiner shall be Active 4 Way unit with RF monitoring port availability.

b) The 4 Way Combiner should be compact in a 1U chassis.

c) The system should have built in 1:1 redundant power supply units.

Hemanshu Goel 15/5/25

B. **Technical Specifications** :

Sl. No.	Parameters	Specifications
1.	Frequency Range	950 – 1750 MHz
2.	Gain flatness	0.6 dB p-p max. 36 MHz
3.	Input Return loss	16 dB minimum
4.	Output Return loss	15 dB minimum
5.	Input Impedance	50 ohms
6.	Output Impedance	50 ohms
7.	Power Supply	Redundant
8.	Input Connector	N Type (F)/SMA
9.	Output Connector	N Type (F)/SMA
10.	Remote Control	RS232 or RS422/485 or RJ 45 or any other port. This should be connectable to LAN using required format converters.
11.	Operational Temperature	0°C to +50°C
12.	Storage Temperature	-55°C to +70°C

5.3.4 Specifications for L Band Redundancy Switch for switching between main and redundant IF to L band Up-Converter -

A Essential Features:

i) L Band redundancy switch is provided for switching between main and redundant IF to L band Up-Converter.

ii) The switch should be able to accept alarm signal from both main and redundant IF to L band Up-Converter for IF to L Band signal output from the healthy IF to L band Up-Converter.

iv) In case of failure of main / redundant chain audio and visual alarm should be generated to indicate the failure of main/ redundant IF to L band Up-Converter.

v) The offered L Band redundancy switch should have dual redundant power supplies.

vi) Facility for automatic, Manual and remote (through web interface) switching of the modulators should be available through the L Band Switch.

vii) The switch should have high reliability, robustness and should be of professional type.

Himanshu 15/5/25

viii) In case of external Redundancy Switch, it should be of the same make as the IF to L band Up-Converter or it should be of approved by IF to L band Up-Converter OEM so that both are compatible for providing the redundancy.

B Technical Specifications

Sl. No.	Parameter	Specifications
i)	Operating frequency range	950 MHz – 1700 MHz
ii)	Insertion loss	≤ 3 dB
iii)	Isolation	
	a) Input to input	45dB min
	b) input to output	50dB min
iv)	Input return loss	13 dB min
v)	Output return loss	13 dB min
vi)	IF connector	BNC/SMA type
vii)	Impedance	50 Ohms
viii)	Remote control	RS232or RS422/485 or RJ 45

5.3.5 Technical Specification for (1:1) L band to Ku band Block Up-converter (BUC) Unit (indoor Type) (Internal/ External with HPA system) -

A. Essential Features :

a) The L band to Ku band Block Up-converter (BUC) Unit (indoor Type) should be in 1:1 redundant configuration Hot-swappable with External or Internal Redundancy Controller.

b) In case of Failure of main Block Up-Converter, the Redundancy switch should be able to provide Ku band Output from the redundant unit through seamless and automatic switching.

c) In case of failure of main/redundant Block Up-converter (BUC) Unit, alarm should be generated to indicate the failure of main/redundant Block Up-converter (BUC) Unit.

d) Facility for Automatic, Manual and Remote (through NMS) switching should be available.

e) Each Block Up-converter (BUC) Unit chassis should have one up-converter system with/without Redundancy Switch and should have its own power supply unit.

f) In case of external Redundancy Switch, it should be of the same make as the Block Up-converter (BUC) Unit or it should be of approved by Block Up-converter (BUC) Unit OEM.

B. Specifications for Internal/External (1:1) L band to Ku band Block Up-converter (BUC) Unit (indoor Type) :-

Sl. No.	Parameters	Specifications
1.	Input Frequency Range	950 MHz – 1700 MHz
2.	Output Frequency Range	13.75 – 14.50 GHz
3.	Bandwidth	750 MHz
4.	Input Port	SMA/N Type (External adopter/converter may be accepted)
5.	Input Impedance	50 Ohms
6.	Output Port	SMA/N Type (External adopter/converter may be accepted)
7.	Output Impedance	50 Ohms
8.	Input level Max (damage Level)	0 dBm
9.	Output Power (1dB compression Point)	+10 dBm (min.)
10.	Monitoring Port	Min. one No. SMA/N Type 50Ω (External adopter/converter may be accepted)
11.	Input Return Loss	18dB((min.)
12.	Output Return Loss	18dB((min.)
13.	Gain	30dB ±3dB
14.	Attenuation Range	0 dB to 15 dB (0.2 dB Steps)
15.	Gain variation over Temp	±0.5 dB (max.)
16.	Gain variation over Freq.	a- ±1 dB (max.) over RF Frequency Band b- ±0.5 dB (max.) over 40 MHz.

17.	Image Rejection	70 dB (min.)
18.	Noise Figure	≤11 dB
19.	Phase Noise	Should be better than 6 dB of the requirements of IESS 308/309
20.	Frequency Stability	a- $\pm 1 \times 10^{-7}$ 0^0C to 50^0C b- $\pm 3 \times 10^{-9}$ per day after 24 Hours.
21.	Spurious Outputs	a) Signal Related ≤- 65 dBc b) Output harmonics ≤- 40 dBc c) Signal Independent ≤- 75 dBm
22.	Remote Control	RS232 or RS422/485 SNMP Protocol on UDP over Ethernet (10 or 100 Mbps), connector RJ-45 HTTP Protocol on TCP/IP over Ethernet (10 or 100 Mbps), connector RJ-45
23.	Display	All the parameters should use digital displays, the accuracy of the display should be given in the offer.
24.	Operational Temperature	0°C to +50°C
25.	Storage Temperature	-10°C to +70°C
26.	Relative humidity	95% non condensing

5.3.6 Specifications for RF Redundancy Switch for switching between main and redundant BUC Unit -

A Essential Features:

i) RF redundancy switch is provided for switching between main and redundant L band to Ku band Block Up-converter (BUC) Unit.

ii) The switch should be able to accept alarm signal from both main and redundant BUC Unit for BUC Unit redundancy.

iii) In case of failure of BUC Unit in one chain, the switching system should be able to provide RF signal output from the healthy BUC Unit.

iv) In case of failure of main / redundant chain audio and visual alarm should be generated to indicate the failure of main/ redundant BUC Unit.

v) The offered RF redundancy switch should have dual redundant power supplies.

15/5/25

vi) Facility for automatic, Manual and remote (through web interface) switching of the modulators should be available through the RF Switch.

vii) The switch should have high reliability, robustness and should be of professional type.

ix) In case of external Redundancy Switch, it should be of the same make as the Block Up-converter (BUC) Unit or it should be of approved by Block Up-converter (BUC) Unit OEM so that both are compatible for providing the redundancy.

B Technical Specifications

Sl. No.	Parameter	Specifications
i)	Operating frequency range	13.75 – 14.50 GHz
ii)	Insertion loss	≤3 dB
iii)	Isolation	
	a) Input to input	45dB min
	b) input to output	50dB min
iv)	Input return loss	13 dB min
v)	Output return loss	13 dB min
vi)	connector	SMA/N (F) type
vii)	Impedance	50 Ohms
viii)	Remote control	RS232or RS422/485 or RJ 45

5.3.7 Technical Specification for High Power Ku wide band RF Amplifier (indoor Type)

A. Essential Features :

a) High Power Amplifier (HPA) is to be used for Final power amplification of the Digital RF signal in Ku Band that would be fed to the antenna system and to be installed in a hall below the corresponding Uplink PDA for minimizing the Waveguide insertion losses.

b) High power Amplifier (HPA) system should be wide band covering full Ku Band Frequency range from 13.75 to 14.50 GHz to be used for Multi carrier operations.

c) Phase combining/Filter Hybrid HPA system should not limit the operation of the HPA to narrow band and the whole system should be wide band.

d) High power Amplifier (HPA) system's RF Power combining assembly shall ensure low loss and max availability of the system.

e) Two sets of HPA System will be required to be offered for transmission in Horizontal Polarization. Each set of HPA system shall be used for uplinking of 4 Carrier of 36 MHz Bandwidth. Bidder should quote the state of the art, highly efficient HPA system with its integrated supplemental power or with redundant chassis (similar to Main HPA chassis) for redundancy as mentioned in clause 5.3.7.A.g.

f) In addition to the above, one set of HPA System will be required to be offered for up linking of 1 Carrier of 36 MHz Bandwidth in Vertical Polarization. Bidder should quote the state of the art, highly efficient HPA system with its integrated supplemental power or with redundant chassis (similar to Main HPA chassis) for redundancy as mentioned in clause 5.3.7.A.g.

g) In case of Solid State High power Amplifier (HPA) system along with its integrated supplemental power should be Modular, Seamless Switchable and have Soft-Fail Redundancy feature. There shall not be a single point of failure. It should have feature to repair/replacement of any HPA without any downtime of the whole system.

OR

In case of TWT, High power Amplifier (HPA) system with redundant chassis (similar to Main HPA chassis) or along with its integrated supplemental power, should be Modular, Seamless Switchable and have auto Redundancy/soft fail redundancy feature. There shall not be a single point of failure. It should have feature to repair/replacement of any HPA without any downtime of the whole system.

h) The Final Output of the HPA system should have feature to give rated RF output power to get the required Link Margin even in case of failure of 25% (in equal or next whole numbers) of main chassis.

i) The HPA system should have provision for forward and reflected power measurement at output of HPA system.

j) The High power Amplifier (HPA) system can be Phase Combined/Hybrid Filter Combined and should include High Power Thick Wall Interconnecting waveguide, Phase combiners, RF Dummy loads, M&C distribution, AC power distribution.

k) The block up converter system should be 1:1 redundant block up converter assembly (internal or external) and integrated with the HPA system.

l) The HPA system should have control and monitoring hardware interface port along with software, which can monitor as well as operate the HPA system remotely.

m) It should have provision for monitoring the forward RF power. Reflected RF power , voltage, Mute Control, Summary alarms etc.

n) Both HPA system (for Horizontal polarization of Antenna) should be able to saturate four transponders, each of 36 MHz bandwidth with the following:-

   a. Power required per 36MHz bandwidth carrier at Antenna Feed Flange is 25W

   b. Rain Fade Margin shall be 9dB (min)..

o) One HPA system (for Vertical polarization of Antenna) should be able to saturate one transponders of 36MHz bandwidth with the following:-

   a. Power required per 36MHz carrier at Antenna Feed Flange is 25W

   b. Rain Fade Margin to be minimum 9dB of rain fade margin.

p) The ERIP Calculations to be provided by the bidder showing the available rain fade margin for multi carrier operations in linear mode using the above parameters.

Table- ERIP Calculations

Sr No.	Description	Unit	Value	Value
1	Number of Carriers Per System Per Polarisation		1	4
2	Power at flange (Peak) Sat	W		
3	Power at flange (Peak) Sat	dBm		
4	Backoff for Linear Region for IMD Specs (for one carrier min. 3 dB and four carrier min. 6 dB)	dB		
5	Total Usable linear Power at flange	dBm		
6	Total Usable linear Power at flange	W		
7	Total Usable Power per carrier at flange of Amplifier	W		
8	Total Usable Power per carrier at flange of Amplifier	dBm		
9	High Power Filter and Diplexer Combining Loss	dB		
10	IFL Loss (min. 1.5 dB)	dB		
11	Axis Cross Over Loss	dB		
12	Power at Feed Input	dBm		
13	Antenna gain	dBi		
14	EIRP Achieved	dBW		
15	EIRP Needed as per Link Budget	dBW		
16	Rain Fade Margin	dB		
17	Available System design Margin	dB		

15/5/25

15/5/2025

B. Technical Specifications for HPA:

Sl. No.	Parameters	Specifications
1.	Frequency Range	13.75 – 14.50 GHz
2.	Bandwidth	750 MHz
3.	Gain	70 dB min.
4.	Gain Slope	0.04 dB/MHz max
5.	RF Level adjust range	0 - 20 dB
6.	Gain adjustment step size	0.5 dB or better
7.	Gain Stability Over Temp.	± 1.5 dB (nominal)
8.	Gain Variation at fixed temp	± 0.75 dB over max over 40 MHz ± 2.25 dB over 750 MHz
9.	Third order IMD	-25 dBc or better, with two equal carriers at 3dB total power back off from rated power
10.	Input VSWR	1.30:1
11.	Output VSWR	1.30:1
12.	Load VSWR	1.50:1
13.	RF Input Connector	N Type (F), 50 ohms
14.	RF Output Connector	Waveguide, WR75G (Grooved)
15.	Output Spurious	-55dBc max @PLinear
16.	Phase Noise	Should be better than 6 dB of the requirements of IESS 308/309
17.	Harmonic Output	-50dBc max @PLinear
18.	Remote Control	RS232 or RS422/485 or RJ 45 or any other port. This should be connectable to LAN using required format converters.
19.	Soft-Fail Redundancy Or Redundant chassis Auto switching	Auto and Manual
20.	Cooling	Forced air with integral blower and power supply fan.

15/5/25

21.	Protection facilities	The supplier should give a detailed account of the protection system like abnormal raise in temperature, reflected power etc, used in the amplifier and its functioning.
22.	Display	All the parameters should use digital displays, the accuracy of the display should be given in the offer.
23.	Operational Temperature	0°C to +50°C
24.	Storage Temperature	-10°C to +70°C
25.	Relative humidity	95% non condensing

5.4 Technical Specification for RF Equipment Control and Management System with switching & interlock facility (RF NMS) for RF Equipment-

A. General Feature

(i) Bidder shall supply, install, test and commission (SITC) of one set of RF Equipment Control and Management System in (1+1) configuration with switching & interlock facility (i.e. RF NMS) for RF Equipment of all Transport streams at DD FreeDish (DRC) Hyderabad and SITC of one set of RF Equipment Control and Management System in (1+1) configuration with switching & interlock facility (i.e. RF NMS) for RF Equipment of all Transport streams at DD FreeDish (Main) Todapur Delhi. Both systems shall be as per site requirement.

(ii) RF NMS shall support switching and interlock at the transport stream level. For example, Transport Stream 1 should be switchable to the Disaster Recovery (DR) site for further processing, while other transport streams continue to operate from the main site. This functionality must support any combination of transport streams. The switching process must be user-defined and should support (a) Manual Switching, (b) Fully Automated Switching (based on predefined process flows defined by User), (c) Semi-Automated Switching, with interactive human approval

(iii) The connectors/drivers for data sources must be in entirely open format, so that Doordarshan or any 3rd party can edit existing interface definitions or create new ones.

(iv) RF NMS shall monitor & manage the entire RF sub-system and integrate for Geo-redundant rain diversity system with DD FreeDish (Main) Todapur Delhi as primary site.

(v) RF NMS clients to be provided for both Operations, NOC and remote site with both full & controlled administrative rights to monitor, control and perform switching as required.

(vi) The RF NMS at DRC Hyderabad shall control the operation, redundancy switching and configuration of the all parameters of HPA, UP-converter, Antenna controller unit, BTR etc at DRC Hyderabad.

(vii) The RF NMS at DD FreeDish (Main) Todapur Delhi shall control the operation, redundancy switching and configuration of the all parameters of HPA, UP-

converter, IF equalizer, Antenna controller unit, BTR etc at DD FreeDish (Main) Todapur Delhi.

(viii) RF NMS, RF systems and Uplink Antenna system at DRC Hyderabad and DD FreeDish (Main) Todapur Delhi shall be synchronised and interlocked in such a way, so that the same RF carrier (with same transponder Frequency) could not be uplinked simultaneously from DRC Earth Station Hyderabad and DD FreeDish (Main) Earth Station Todapur Delhi.

(ix) The status of complete RF system and Uplink Antenna system available at DRC Hyderabad shall also be available at DD FreeDish (Main) Todapur Delhi and vice versa.

(x) The RF NMS shall control the operation, redundancy switching and configuration of the all parameters of HPA, UP-converter, Antenna controller unit, BTR etc including alarm, audio visual warning and fault logs for a minimum of 365 days.

(xi) The RF NMS at DD FreeDish (Main) Earth Station Todapur Delhi shall be based on industry standard hardware and software that will provide a user-friendly GUI to the operator. It will consist of Rack mounted server and 2 client computer with client license along with 21 inch display monitor, keyboard and mouse (one in RF room and one in monitoring room).

(xii) The RF NMS at DRC Earth Station Hyderabad shall be based on industry standard hardware and software that will provide a user-friendly GUI to the operator. It will consist of Rack mounted server and 3 client computer with client licenses along with 21 inch display monitors, keyboards and mouse (one in RF room, One in compression Room and one in monitoring room).

(xiii) It shall be possible to add a remote user terminal and IP interface to provide access to the RF control system computer from a remote location broadband network.

(xiv) The remote user shall have access to all the commands available at the main control system, subject to password restrictions for security. The remote user shall be presented with a user interface, which is identical to the local user interface.

(xv) The RF NMS in (1+1) configuration to be commissioned at DD FreeDish (Main) Todapur Delhi, shall provide an unconditional and guaranteed interface with RF system equipment consisting of HPA, UP-converter, Antenna controller unit, BTR etc at DD FreeDish (Main) Todapur Delhi. The make and model of equipment of RF system at DD FreeDish (Main) Todapur Delhi is given below in Table A.

Table A

Sr No.	Equipment	Make	Model	Quantity (Tentative minimum)
1	HPA (KHPA)	CPI	K4U74C	12
2	UP-converter	GD SATCOM	SCR 1400 BU	4
		NEWTEC	FRC 0710	6
		COMTECH	UT-4514	3
3	Redundancy Switch	GD SATCOM	Star Switch	1
		NEWTEC	USS 0202	3
4	Power Control Unit	MITEQ	UPC-A	4

5	Antenna controller unit	GD SATCOM	7134	3
6	BTR	GD SATCOM	201800-AC00	3
7	LNA Controller	GD SATCOM	RSC-1200	3
8	Modulator	NEWTEC	Azimuth AZ110	10
		Novelsat	NS 1000	6
9	Redundancy Switch	NEWTEC	Azimuth AZ210	6

(xvi) The RF NMS in (1+1) configuration to be commissioned at DRC Hyderabad shall provide an unconditional and guaranteed interface with RF system consisting of HPA, UP-converter, AUPC, Antenna controller unit, BTR etc at DRC Hyderabad.

(xvii) It shall have the feature of integrations including interfacing via physical interfaces such as Ethernet, RS232, synchronous, and asynchronous RS485/RS422, GPIB, analogue and digital contacts, using both standard (including, but not limited to Modbus, SOAP, XML, APIs, CORBA, WMI, SQL, HTML, telnet, SSH, SNMP, etc.) and full proprietary / vendor-specific protocols.

(xviii) The solution shall be able to interface with devices directly, as well as and at the same time with existing NMS system. NMS integrations shall support any type of interface (including but not limited to SNMP, XML, proprietary APIs, etc.) and shall be able to provide also advanced capabilities such as automatic device replication.

(xix) The RF NMS shall provide the capability to integrate IT and Broadcast equipment and applications including Data network equipment: HPA, UP-converter, Antenna controller unit, AUPC, BTR , switches.

(xx) The RF system equipment and their application interface must always be integrated in a complete way. e.g. in case of a device with an SNMP interface, the complete MIB is integrated allowing all available monitoring and control functions.

(xxi) There is a provision that any third party must be able to design new interface for any device or application with the offered RF Equipment Control system solution.

(xxii) The interface definitions must be in entirely open format (like XML), so that Doordarshan or any 3rd party can edit existing interface definitions or create new ones.

(xxiii) The RF NMS shall allow for minimum 10 simultaneous client access from any location (web-based GUI)

(xxiv) The RF NMS being able to scale horizontally to manage large enterprise networks with 300 of devices and applications.

(xxv) The RF NMS shall have 1+1 hot redundancy, synched in real-time and with user-definable fail-over.

(xxvi) The RF NMS must be available as on-premise installation.

(xxvii) The RF NMS must support Pro-active Maintenance & Support, e.g. through self-diagnostic software, self-healing software, self-maintaining database, scheduled health-reporting, etc.

(xxviii) The RF NMS shall support user-definable automatic back-up at pre-defined time intervals.

(xxix) The RF NMS must support defining internal user accounts (with username & password), defining user groups and assigning individual users to one or more groups.

(xxx) The RF NMS must support creating different user roles and assigning detailed use and access rights for each role. It shall feature to keep detailed historical-trailing of all user activity, including access and user action.

(xxxi) The offered system shall offer a comprehensive fault management experience, including visual alarm threshold editing alarm. It shall support management of active and historical alarms, with absolute and relative alarm thresholds.

(xxxii) The offered system shall allow the user to select other levels of severity (e.g. warning, minor low, critical low, critical high etc).

(xxxiii) The offered system shall have GUI, with alarms bubble-up to the top level view and operators can click and drill down to more detailed views of the affected area.

(xxxiv) The offered system must have feature to detect faults or incidents analysis for forecasting and artificial-intelligence-based correlation to provide Analytics & Proactive management.

(xxxv) The offered system must have feature for reporting, providing a sufficient statistical analysis information with sorting features. It should provide advanced usability features, including but not limited to: copy and paste any of the graphs (e.g. into a Word document or e-mail), export data of the graphs in csv format (e.g. to import in Excel), expand graphs, etc.

(xxxvi) The offered system should support of time and event triggered e-mail and SMS reporting, based on user-defined report templates.

(xxxvii) The operator must be able to simply access reports and analysis, browse graphs via the web GUI.

(xxxviii) The RF NMS must support operators to design own user-defined dashboards that consolidate all essential information and Key Performance Indicators.

(xxxix) The RF NMS must support editing, adding or deleting correlation rules at run-time, without any interruptions in operation of RF system.

(xl) The RF NMS shall allow operators to create automation scripts, designed with an intuitive graphical user interface hence automating operational procedure.

(xli) The RF NMS shall provide extensive and full user-definable scheduling capabilities.

(xlii) The RF NMS shall be able to automatically ingest a variety of information about planned maintenance.

(xliii) The hardware configuration is suggestive and minimum and actual offer should be based on the requirement of system while server shall not be loaded more than 70%.

B. Required Hardware and Software

The compression system control computer shall be based on industry standard, open system hardware and software that will provide a user-friendly GUI to the operator. The hardware configuration is minimum and actual offer should be based on the requirement of system while server shall not be loaded more than 70%.

Sl. No.	Parameter	Specification
1	Man Machine Interface	Graphical User Interface (GUI)
2	Operational Features	Based on latest Windows / Linux version:

		(a) Diagnostic log (b) Transaction log (c) Password privilege system (d) Through Broadband (e) Multi user terminal support
3	Physical Connection to Equipment	Ethernet 10 Base-T/100 Base-T through CAT 6 or better cable
4	Hardware Platform	Supplier to provide full details of the industry standard hardware platform proposed.(minimum configuration as follows) 1. RAM -64 GB 2. Disk 240GB SSD Raid1 3. CPU 16 vCPU 4. OS- Linux/Windows server 2022 or latest version
5	Software	Supplier to provide full details of the industry standard software platform proposed
6	Back up on USB storage	The back up/ recovery USB storage for all the software are to be provided with proper licenses.
7	No of Equipment/Element to be controlled and monitored by offered RF NMS at each site.	300 Nos. (Minimum)
8	Server for storage of Management, Log etc (As per requirement of system) shall be given at both Sites.	SSD, 1TB (Min.)
9	Operating Environment	
i	Operating Temperature	10 °C to +35°C
ii	Humidity	10% to 90 % Non-Condensing

5.5 Uplink Antenna System

5.5.1 Specification for 9.0 to 9.4 mtr uplink antenna system

A. Introduction

This antenna would be used for up-linking digital channels through chain of HPA system. Antenna should conform to latest CCIR recommendations, CCIR Rec. 580-5 or latest, satisfying the 29 - 25 log (theta). Antenna should be made up of light weight stretch formed/Precision formed Aluminum material with heat diffusing white paint. All the iron part of Antenna should be hot dip galvanized.

B. Specification for 9.0 to 9.4 m PDA

Sl. No.	Parameters	Specification

1	Antenna Type	Motorized, Cassegrain / Gregorian with sub-reflector
2	Reflector Type	Solid Segmented
3	Reflector Panel Material	Stretched formed or Precision formed Aluminum Alloy
4	Reflector paint	White heat diffusing paint
5	Mount Type	Mount of Elevation and Azimuth for independent movement.
6	Feed	4-Port Linearly Polarized
7	Operating Frequency Band	
	a) Ku- band Transmit	13.75 GHz to 14.50 GHz
	b) Receive	10.70 to 12.75 GHz
8a	Gain of 9.0 mtr Antenna (at Mid-band, at Rear Feed Flange)	
	a) Ku- band Transmit at 14.0 GHz	60.0dBi (min.)
	b) Ku- band Receive at 11.0 GHz	58.4 dBi (min.)
8b	Gain of 9.1 mtr Antenna (at Mid-band, at Rear Feed Flange)	
	a) Ku- band Transmit at 14.0 GHz	60.1dBi (min.)
	b) Ku- band Receive at 11.0 GHz	58.5 dBi (min.)
8c	Gain of 9.2 mtr Antenna (at Mid-band, at Rear Feed Flange)	
	a) Ku- band Transmit at 14.0 GHz	60.2dBi (min.)
	b) Ku- band Receive at 11.0 GHz	58.6 dBi (min.)
8d	Gain of 9.3 mtr Antenna (at Mid-band, at Rear Feed Flange)	
	a) Ku- band Transmit at 14.0 GHz	60.3dBi (min.)
	b) Ku- band Receive at 11.0 GHz	58.7 dBi (min.)
8e	Gain of 9.4 mtr Antenna (at Mid-band, at Rear Feed Flange)	
	a) Ku- band Transmit at 14.0 GHz	60.4dBi (min.)
	b) Ku- band Receive at 11.0 GHz	58.8 dBi (min.)
9	Side lobe Performance	ITU-R, S. 580-5 or latest
10	G/T at 20 ^{0} elevation with 70^0 K LNA OR Noise temp. at 20 degree elevation	37 dB/K (min.) OR 82 degree K(max) Note: The compliance may be given in respect of any one of parameter or both parameter.
11	Steer ability	Motorized antenna control system for auto and manual tracking
a	Azimuth Travel	180° in two segments of 110° continuous
b	Elevation Travel	5° to 85° continuous

c	Polarization Travel	± 50°
12	Azimuth Travel Rate	0.3 to 0.5 degree/sec
15	Elevation Travel Rate	0.3 to 0.5 degree/sec
16	Polarization Travel Rate	1-1.5 degree/sec
17	VSWR (TX / Rx)	1.35:1 (max)
18	Transmit /Receive Isolation	85dB (min.)
19	Power handling capacity for feed per Port	1.5 KW continuous
20	Wind Speed	
a	Gusting	95 km/h (min.)
b	Operational	72 km/h (min.)
c	Survival	200 km/h (min.)
21	Polarization Discrimination across 1 dB beam width	30 dB (min.)
22	Both receive ports should have TRFs or diplexer to achieve Transmit / Receive Isolation of 85 dB min.	
23	Both transmit ports should have directional couplers with factory measured coupling ratio printed on it for the full frequency range.	
24	A de-hydrating arrangement should be offered with the antenna system. Dehydrator should be regenerative and should be able to provide suitable pressure to waveguide run	
25	A calibrated graduation of Azimuth, Elevation and Polarization Offset should be provided in the Antenna.	
26	The wind load data, foundation data for installation should be included.	
27	Suitable ladder and platform of antenna OEM make should be provided for ease of operation in the offered antenna system.	
28	Antenna System should have hub closeout/ covers.	
29	The antenna should be Cassegrian or Gregorian type with sub reflector.	

C. General Requirement

(i) Bidder will have to supply, install, test and commissioning the PDA including NOCC clearance.

(ii) Both Sets of Ku band (9.0 to 9.4 mtr) uplink PDA system will be installed on platform raised from tentatively 4 m from the ground. As the HPAs and related RF equipment are to be installed in the hall below PDA, the ceiling of the hall should be minimum 10 feet height. Bidder shall cover the space between of Both PDA foundation by RCC and the ceiling of the covering should be minimum 10 feet height to accommodate the ancillary equipment of RF system/monitoring and control of RF system below that space. The distance between PDA base centers should be tentatively 15 m. The PDA foundation will also be provided.

(iii) The detailed schematic diagram showing the Antenna foundation & installation and connection of accessories, including bar bending schedule, bill of materials and procedure to be followed in the installation must be given along with bid. Whereas the successful bidder shall submit the OEM approved Antenna foundation drawing & installation and connection of accessories, to DGDD for approval.

(iv) Accessories like (2+1) Ku-band LNA, Semi-rigid & Flexible waveguides, Dehydrator, Antenna Controller unit (ACU), Beacon Tracking receiver (BTR) are also to be provided.

(v) Assorted items like RF cables with connectors (N type, Male & Female), Billets N type, RF splitter (1: 2 passive type) etc are also to be provided.

(vi) Wave – Guide support tray & cable tray also to be provided at site. The Support poles & Cable tray with cover must be made up of galvanized iron material and should be painted with anti-rust, anti-corrosion paint.

(vii) As an SITC contract, all supplied equipment are to be installed, tested and commissioned at site by the bidder. The cost of any other interconnecting material and labour including that for laying of cables, earthing, earth pits, Lightening arrester for antenna etc. should be included.

5.5.2 Specification for Antenna Control Unit (Antenna Controller) with Step Tracking

(i) Antenna controller should be of the same make as the antenna or it should be of approved by Antenna OEM.

(ii) The controller should display the current position of Azimuth, elevation and polarization with relative power reference of the received tracking signal strength.

(iii) The antenna controller unit shall be kept at a distance of approx 100 meters away from the antenna. Necessary cabling etc. is to be provided.

(iv) Tracking accuracy should be better than 10% of the receive 3 dB beam width.

(v) Position Encoding should use single speed brush less revolvers or highly reliable encoders.

(vi) Position Encoding resolution: 10 bit

(vii) The system should also have manual control flexibility for all the three axes.

(viii) Antenna controller should be of rack mount type.

(ix) Controller should have following control modes- Manual, steptrack, Program track, move to look angles etc.

Himanshu Goel 15/5/25

5.5.3 Technical Specification of Beacon Tracking Receiver

A. General

Fully frequency agile satellite receiver designed to provide a linear DC reference voltage proportional to the received signal of a satellite beacon.

BTR shall be of the same make as the antenna or it shall be of approved by Antenna OEM (A certificate from antenna OEM should be submitted along with the offer).

B. Beacon Receiver Requirements

Sl.	Parameter	Specification
1	Voltage output	0 to +10 V DC or 0 to –10 V DC
2	Contact closure status outputs	closure for fault or open fault

C. Power requirements

Sl.	Parameter	Specification
1	Frequency	48-52 Hz
2	Power consumption	40 W typical

D. Connectors

Sl.	Parameter	Specification
1	Signal path	BNC /N type female
2	Beacon level voltage inputs	BNC /N-type female
3	Receiver fault inputs	DE-9P
4	Status outputs	DB-25S
5	Remote interface RS485,RS422	DE-9S

E. Technical Specifications

Sl.	Parameter	Specification
1	Frequency	10.70 GHz to 12.75 GHz with 10 KHz step
2	I/P level	-50 dBm to –90 dBm
3	Tracking slope	0.5 V/dB or 2 dB/V
4	I/P connector	SMA 50 Ohms

5	O/P connector	Suitable to feed to the Antenna Control Unit as well as Uplink Power Control system
6	Tracking response	0 to + 10 V or 0 to –10 V DC over 20 dB attenuation range in 0.1 dB steps
7	Tracking linearity	±0.5 dB
8	Threshold	4 dB C/N or <45 dB-Hz (C/N0) for acquisition ; less than 1 dB C/N for carrier lock
9	AFC	± 25 KHz
10	Type	19" rack mountable

5.5.4 Technical Specification of Automatic Uplink Power Control (AUPC) System:-

A. Essential Features :

a) The Automatic Uplink Power Control (AUPC) is used to control the Up-link power proportional to the attenuation experienced in the received signal strength.

b) AUPC should measure the 'link losses' from a satellite beacon signal and subsequently automatically control the uplink power.

c) The beacon receiver can either be a separate external unit providing a DC signal to the unit or internal beacon receiver based.

d) It should have comprehensive configuration & control features, fault monitoring protection, safe-start routines, failsafe bypass and in-built redundancy to ensure minimum disruption of uplink signals.

e) It should be of 19" rack mount and of 1RU of rack space

f) IT should have 1 : 1 redundant power supply.

B. Technical Specifications :

Sl. No.	Parameters	Specifications
1.	Input Frequency	10.7Ghz -12.75 GHz
2.	Input Range	-90 dBm to -50dBm ,
3.	Input Damage Level	0 dBm
4.	DC input ranges	±10VDC, ±5VDC, 0 to 10VDC, -10 to 0VDC, user selectable
5.	Ageing	<3 x 10-10 per day, <3 x 10-8 per year
6.	Temp stability	<2 x 10-9 over 0 to 500C

7.	Return loss	15dB nominal (input and output)
8.	Attenuation control	0-30dB, stepped 0.5dB or better
9.	Bypass mode	Fail-safe switching to external user selectable pad
10.	Bypass insertion loss	2dB nom (plus external pad attenuation value)
11.	Operating temp	0 degree C to +50 degree C
12.	Power supply voltage	220 V nominal
13.	Remote control	Ethernet; embedded web server & SNMP network management support

5.5.5 Technical Specifications for Ku-Band Dual Redundant LNA system

Sl.	Parameter	Specification
1	Frequency Band	10.70 GHz to 12.75 GHz
2	Gain of the LNA	55 dB min.
3	Gain flatness	± 1 dB full band
4	Gain stability	+/- 0.5 dB max.
5	Input waveguide	WR75
6	Input VSWR	1.30: 1 Max.
7	output VSWR	1.50: 1 Max.
8	Power output at 1 dB compression	+10 dBm
9	Third Order output intercept point	+20 dBm
10	AM/PM conversion	0.25^0/dB at (–5) dBm
11	Linear group delay	0.02 ns/MHz
12	Parabolic group delay	0.002 ns/MHz
13	Ripple	0.2 ns p-p
14	Maximum input power (without damage)	0 dBm
15	Output connector	N type standard
16	Power supply	DC + 18 V to 24 V
17	Operating Temperature	0 ° to + 50° C
18	Power Supply connection	The supply should be given through a separate cable to the LNA
19	Noise Temperature	≤ 70^0 K
20	Band Pass Filter for Receive Antenna for Ku--band before LNA	should be provided

5.5.6 Technical Specification for Ku-band receive/downlink PDA

A. Specification

Sl.	Parameter	Specification
1	Type	Offset
2	Frequency	10.70 to 12.75 GHz
3	Size	60cms, 90cms and 120cms.
4	Cross polarisation on axis	30 dBi (min)
5	VSWR	1.3:1
6	Aperture efficiency	better than 70%
7	Gain at 11.7 GHz	better than 35 dBi (60 cms) better than 39 dBi (90cms) and better than 41dBi (120 cms)
8	Reflector (F/D) ratio	0.6
9	Surface accuracy	better than 0.01"
10	Wind loading	70Km/H operational
		150 Km/h survival
11	Mount option	Pole Az-El and Pole wall
12	Reflector Material	steel or aluminium with powder coating

B. General

a) Receive dish should contain a feed support system.

b) Receive dish should have a simple one handed elevation adjustment with degree scale stamped onto the side of the mount to simplify alignment and a full 360 degrees azimuth adjustment.

c) Receive dish should have excellent corrosion resistance coating like powder coat or galvanization.

C. Specification for LNBF

Sl.	Parameter	Specification
1	RF frequency range	10.7 – 11.7 GHz (low) 11.7- 12.75 GHz(high)
2	IF Range	950- 1950 MHz (low) 1100-2150 MHz (high)
3	Noise Figure	better than 0.6 dB
4	LO frequency	9.75 GHz (low) 10.60 GHz(high)
5	LO stability	better than ± 2 MHz
6	LO phase noise	-50 dBc @1 KHz
		-75 dBc @ 10 KHz
		-95 dBc @ 100 KHz
7	Inband Spurious	less than –65 dBm
8	Current Consumption	less than 150 mA

9	Band selection	22 KHz Tone
10	Output Connector	F –Type Female
11	Output return loss	8 dB min
12	Conversion gain	48 dB min
13	Gain flatness	better than ± 0.5 dB over 36 MHz
14	Supply Voltage	11.5 – 14.0 V (vertical) 16.0- 19.0 V (horizontal)

Note : LNBF's should be environmentally sealed against weather conditions and extremes of temperature. LNBF's should also have a plastic cover for protection against driving rain and ice.

5.6 Monitoring System

The monitoring system has two parts:

(a) Confidence level monitoring system
(b) Input and downlink monitoring system of TV and Radio channels

A confidence level monitoring system consists IRDs with L-Band inputs, IRD with ASI input, IRD's with IP input, 64x32 SDI Router, Waveform monitor,17"colour monitor, and 16 channel Audio Video Monitor, Test Pattern Generator etc. However, WFM will be used for confidence level Monitoring.

The input monitoring system of TV channel consists of IRDs with MPEG-2 TS over IP output, TV and Radio channel Multi Image Display System, 55" LCD Video Wall Display and associated accessories.

The downlink monitoring system consists of DVB-S & DVB-S2 de-mod with/and DVB-CAS Descrambler (CAS), TV and Radio Channel Multi Image Display System, 55" LCD Video Wall Display associated accessories.

The specifications of main equipment of monitoring systems are given below.

5.6.1 Confidence Level monitoring system

5.6.1.1 Specification for 17 inch (Nominal) LCD (TFT) SD & HD Colour Monitor

A) ESSENTIAL FEATURES:

i) The offered monitor should incorporate high intensity, high contrast wide screen 17 inch (Nominal), wide viewing angle LCD Panel to view stable images from various angles: both horizontally and vertically, with no reduction in picture contrast, brightness and colour saturation.

ii) The LCD panel of the offered monitor should have resolutions of 1920 x 1080 pixels in 16:9 aspect ratio. The offered monitor should support 16:9 and 4:3 aspect ratios of the video signal. The monitor should also support 1920X1080/50I (HD) and 720X576/50I (SD) video formats.

iii) LCD colour monitor should accept SD and HD SDI input (detected automatically).

iv) The offered monitor should support embedded audio.

v) The offered monitor should have 10-bit signal processing.

vi) The monitor should have 1:1 pixel mapping to display the pictures in the original resolution (subject to the native resolution of the LCD panel) and aspect ratio of the input signal without any stretch and distortion.

vii) It should be possible for the user to select the industry standard colour temperature through menu for matching colours and gradation of the monitor.

viii) The LCD panel should be coated with Anti-Reflection protection layer to provide high transmission rate of the internal light source and to keep the reflection from ambient light to a minimum.

ix) The monitor should have an external remote control capability via Ethernet, serial or similar interface.

x) The monitor should be light weight, robust, compact and 19 inch rack mountable. It should have front panel controls to control the display parameters like brightness, contrast, colour saturation, audio etc.

B) Technical Specifications

Sl. No.	Parameter	Specification
1	Display Size	17 inch(Nominal) diagonally
2	Resolution	1920x1080 pixels or better
3	Colour reproduction	16 millions or better
4	Contrast ratio	300: 1 or better
5	Viewing Angle	150 degree (min.) in Horizontal
		150 degree (min.) in Vertical
6	Brightness	250 cd / sq. m or better
7	Supported Aspect ratio	4:3 and 16:9
8	Video Input	HD & SD-SDI (BNC) x 2 or more
9	Audio input	Embedded Audio
10	Video Format	SD 720 x 576, 704 x 576, 544 x 576, 480 x 576, 352 x 576 1920X1080/50I (HD)

5.6.1.2 Specification for 16 Channel Audio/ Video Monitor

a) ESSENTIAL FEATURES:

i) Audio/Video Monitor is to be used for confidence level monitoring of transmission chain at various points. Output of 64x32 SD/HD-SDI router will be fed to 16 Channel Audio/Video monitor Refer DRG No.18.

ii) There shall have the facility to decode and display SD & HDTV channels; and Radio Channel received through RTMP, SRT IP Multicast Streaming.

iii) It shall accepts MPEG streams over IP (RJ45) input and shall decode compressed video in MPEG2, H.264 & HEVC and audio in MPEG Layer 1/2/3, AAC and Dolby audio for up to 5.1 channels.

iv) The offered Audio/Video monitor should have high resolution LCD/OLED/TFT screen and support 1920X1080/50I (HD-SDI) and 720X576/50I (SD-SDI) video formats.

v) It should decode and display upto 16 channel multi format audio embedded with SDI simultaneously like Dolby Digital (AC-3) 5.1 audio, Dolby digital plus 5.1 (E-AC-3) audio, AES/EBU stereo channel for monitoring and metering.

vi) The offered system should have multi channel audio bar graph and speakers and should not be overlayed on the video.

vii) It should be 19" rack mountable and have facility to monitor loudness and save minimum 5 preset configurations.

b) Technical Specification :

Sl.	**Parameter**	**Specification**
1	SDI input format	**a)** SMPTE 259 M SD-SDI with embedded audio **b)** SMPTE 292 M HD-SDI with embedded audio
2	IP Input Format	(i) MPEG 2 TS over IP (SPTS & MPTS) (ii) RTMP stream, (iii) SRT stream (iv) UDP stream
3	Embedded Audio on SDI	i)Dolby digital (AC-3) 5.1 audio, ii)Dolby digital plus 5.1(E-AC-3) audio iii) Dolby E iv) One Stereo AES/EBU
4	SDI input quantity and Type	2 Nos., SD & HD-SDI input
5	Connector type	BNC, female
6	No. of IP Port	1. Minimum 1 Ports (RJ 45), 1 Gbps min for MPEG streams over IP (SRT, UDP multicast and RTMP). 2. Minimum 2 Management ports (RJ 45)
7	Audio input format	8 channel/ 4 stereo digital AES / EBU
8	AES and SDI termination	75 ohm unbalance
9	Level meter scaling	AES/EBU, VU
10	Level meter Parameter	Threshold, Reference, limits
11	Loudspeaker Power	12 W per speaker
12	Display Screen type & size	LCD/OLED/TFT , min 3.4 inch (diagonal) or better

5.6.1.3 Test Loop Translator (TLT for Ku--band U/L to L-band)

Shirwash 13/5/25

Test Loop Translator (Ku-band uplink frequency to L-band) is to be used to check the monitoring output of Up converters & HPAs. Monitoring ports of Up converter and HPAs will be fed to TLT using a RF patch panel. Output of TLT will be fed to IRD through L band Fibre link and L-Band router. Refer DRG No.- 16, 16A. The specifications are detailed below:

Sl.	Parameter	Specification
1	Input Frequency	13.75 GHz to 14.5 GHz
2	Output Frequency range	950 MHz to 1450 MHz
3	Input return loss	15 dB minimum
4	Output return loss	15 dB minimum
5	Phase Noise	IESS308/309 compliant

5.6.1.4 70 MHz to L-band Up-converter Specifications

70 MHz to L-band Up converter is to be used to check the monitoring output of modulators. Output of this Up-converter will be fed to IRD through L-Band router. The specifications are detailed below:

Sl.	Parameter	Specification
1	Input Frequency	70 MHz ± 18 MHz
2	Output Frequency range	950 MHz to 1450 MHz
3	Frequency Steps Size	Synthesized 125 KHz
4	Input return loss	15 dB Minimum
5	Output return loss	14 dB Minimum
6	Gain	15 dB
7	Phase Noise	IESS308/309 compliant
8	Spurious	-55 dBc modulated (carrier related)
		-60 dBm unmodulated (Non carrier)

5.6.1.5 Specification for Ku-Band (Downlink) to L-Band Down Converters

Sl.	Parameter	Specification
	INPUT CHARACTERISTICS	
1	Frequency	10.70 MHz - 12.75 GHz
2	Return Loss (50 ohms)	20 dB minimum
3	LO Leakage	-80 dBm maximum
4	Signal monitor	-20 dBc nominal
	OUTPUT CHARACTERISTICS	
5	Frequency	950 MHz - 1750 MHz for Ku--band
6	Return loss (50 ohms)	-18 dB minimum
7	Signal monitor	-20 dBc nominal
8	Power output (1 dB compression)	+18 dBm minimum

	TRANSFER CHARACTERISTICS	
9	Gain	30 dB, ±3 dB
10	Gain stability	±0.25 dB/day maximum at constant temperature
11	Amplitude response	(a) ±0.25 dB/40 MHz maximum (b) ±1 dB maximum over L-band
12	Image rejection	60 dB minimum
13	Noise figure	11 dB maximum
14	Intermodulation distortion (third order)	With two in band signals at 0 dBm output, third order intermodulation products are less than 60 dBc
15	Spurious outputs (in band)	
a	Signal related	65 dBc min at 0 dBm output
b	Signal independent	-75 dBm maximum
16	Phase noise	IESS308/309 compliant
17	Frequency stability	$\pm 2 \times 10^{-8}$, 0 to 50°C

5.6.1.6 L-Band Router (64 x 64) with control panel

A. Introduction

(i) L band signal shall be received through RF cable from various up and down converters. The output of L band router shall be connected to confidence level monitoring IRDs.

(ii) Router should have Full fan out (splitting) facility such that it can be configured to route any of the input (64 input) carrying L band signal to any of the output (64 no. outputs).

(iii) It should have dual redundant Power supply unit.

(iv) The unit shall be able to provide DC power to LNBCs through PSU of the same make as of router.

(v) The control of the L-band router (LBR) should be through OEM supplied NMS apart from the manual control, (through external control panel or control panel on router or front panel touch screen panel for control) & configuration.

B. Specification

Sl.	Parameter	Specification
1	Operating frequency	950 to 2150 MHz
2	**Isolation**	
a	Input to input	60dB (min.)
b	Output to output	60 dB (min.)
c	Input to output	50 dB (min.)
3	**Return loss**	
a	Input return loss	10 dB (min.)
b	Output return loss	10 dB (min.)
4	Input/output RF Connector	Type "F/BNC"
5	Impedance	75 ohm
6	Remote control	RS 232 or RS422/485 or RJ45

5.6.1.7 Specification for Monitoring Demod cum Decoder with L band, ASI & IP input for SDTV & HDTV-

A. General

(i) The Monitoring Demod cum Decoder should receive the L band input and give digital (SD-SDI, SD-SDI with Embedded Audio, AES/EBU, HD-SDI, HD-SDI with Embedded Audio), ASI outputs and MPEG-2 TS over IP output with multiple services filtering facility and bulk decryption.

(ii) One SD-SDI down converted output of HD-SDI should be available.

(iii) Monitoring Demod cum Decoder should be able to carry out multiple services filtering on IP output port.

(iv) Monitoring Demod cum Decoder should have provision to enter or edit all the parameters for perfect reception of the signals through either front control panel display or Web browser.

(v) There shall be a provision for observing BER & signal level or C/N & C/N margin or Eb/No & Link Margin for DVB-S mode of operation and PER & signal level or C/N & C/N margin or Es/No & Link Margin for DVB-S2 mode of operation through either front control panel display or Web browser.

(vi) Monitoring Demod cum Decoder should be able to bulk descramble BISS mode 1 and BISS-E signals.

(vii) There should be at least one vacant slot (CI slot) for each channel of conditional Access System (CAS) for descrambling all MPEG-2, H.264/MPEG 4 & H.265/HEVC encoded channel and DVB-S & DVB S2 compliant services. Each CI slot should be integrated/configured with atleast two L band input port.

(viii) There should be direct decompression of ASI to SDI i.e. not through analog to Digital conversion.

(ix) Monitoring Demod cum Decoder should be able to store at least 10 presets channels configuration in memory.

(x) Monitoring Demod cum Decoder should be able to generate and save log for alarms and warning.

(xi) Monitoring Demod cum Decoder should have facility to pass ancillary data like closed captioning, EIA 608/708, DVB-Teletext, DVB- subtitle, DPI SCTE-35 etc.

(xii) One Monitoring Demod cum Decoder shall be mounted in one chassis.

B. RF Parameter Specifications

Sl. No.	Parameters	Specification
1	Input Frequency Range	950 - 2150 MHz
2	No. of Inputs	2 (min.)
3	Tuning Step Size	125 kHz, Max.
4	Satellite Frequency Band	C- Band & Ku-Band, Selectable
5	Input Impedance	75 Ohms
6	Input Connector	F-Type female
7	Input Power Range	-30 to -60 dBm per carrier

8	Image Rejection	>30 dB
9	Input Return Loss	9 dB Min.
10	Noise Figure	15 dB Max.
11	AFC Tuning Range	± 5 MHz
12	De-Modulation Method	DVB-S QPSK, DVB-S2 QPSK and 8PSK
13	Variable Symbol Rates	1.0 to 40 M Symbol /sec for (DVB-S) 1.0 to 40 M Symbol /sec for (DVB-S2)
14	Convolution Inner FEC selectable	R=1/2, 2/3, 3/4, 5/6,7/8 (DVB-S, QPSK), R=1/2, 3/5, 2/3, 3/4, 4/5,5/6, 8/9, 9/10 (For DVB-S2, QPSK) R= 3/5, 2/3 , 3/4, 5/6,8/9,9/10 (DVB-S2 , 8PSK)
15	IF Filter Bandwidth	Automatic Selection (dependent on Symbol Rate).

C. ASI Input and ASI Output Transport Stream specification

Sl. No.	Parameters	Specification
A	**ASI Input**	
1	Format	MPEG-2 TS over ASI on BNC
2	Quantity for ASI Input	Minimum one no. on BNC
B	**ASI Output**	
1	Format	MPEG-2 TS over ASI on BNC
2	Quantity for ASI Output	Minimum one no. on BNC

D. Audio and Video Decompression Parameters

Sl. No.	Parameters	Specification
1	Video Resolution (all resolutions shall be capable of I, P & B frame decoding, other standard solution should be selectable)	i) For SDTV 720 X 576 544 X 576 480 X 576 ii) For HDTV 1920x1080 1440x1080
2	Video Decompression Type	(i) SD MPEG-2, MP@ML, 4:2:0 (ii) SD MPEG-2, 422@ML, 4:2:2 (iii)SD MPEG-4, MP@ L3, 4:2:0 (iv)SD MPEG-4, Hi422@ L3, 4:2:2 (v) HD H.264 MP@ Level 4.0 4:2:0 (vi)HD H.264 Hi422 @ Level 4.0, 4:2:2 (vii) HD H.265/HEVC Main 10 4:2:0
3	Television Standard	PAL-B (EN50083-9)
4	Audio Decompression Type	i) MPEG-1 Layer-II audio

Himanshu 15/5/25

		ii)HE AAC(MPEG 4) v1 & v2 5.1 Audio iii)Dolby Digital (AC-3) 5.1 Audio iv) Dolby Digital plus 5.1 Audio (E-AC-3) (Pass through) v) Dolby E (Pass-through)

E. Digital Video output Specifications (SD-SDI & HD-SDI)

Sl. No.	Parameters	Specification
1	SD-SDI and HD-SDI O/P Serial Interface	SMPTE 259M-(10 bit) 270 Mbps SMPTE 292M-1485 Mbps
2	SD-SDI with Embedded Audio	SMPTE 272M
3	HD-SDI with Embedded Audio	SMPTE 299 M
4	Video Output Format	HD-SDI and SD-SDI
5	Connector Type	BNC (75 Ohms)
6	Quantity	Minimum 2 Nos. of digital output compliant to ITU-R BT.656 Standard or latest
7	Level	800mV p-p for SDI As per ITU-R BT.601 (part A) and ITU-R BT.709

F. Digital Audio Output Specifications

Sl. No.	Parameters	Specification
1	Output Format	i) AES/EBU or AES3 id ii) HE AAC(MPEG 4) v1 & v2 5.1 Audio iii)Dolby Digital (AC-3) 5.1 Audio iv) Dolby Digital Plus 5.1 Audio (E-AC-3) (Pass- through) v) Dolby E (Pass-through)
2	Load Impedance	75Ohms/110 Ohms
3	Connector Type	BNC Female / XLR male Socket or with suitable XLR adapter (i.e. no terminal block)
4	Number of Output	4 Stereo Channels

G. LNB Power Supply & Control

Sl. No.	Parameters	Specification
1	LNB Voltage	+ 13 V (Vertical) and 18 V (Horz) polarizations switching or 19 V fixed.
2	Power Consumption	300 mA. (Max.)
3	Over Current and short circuit protection	Fold back current limiting.
4	LNB Power Supply & Control	Receive Polarization Control by electrical Command Via LNB-IF feeder (High & Low band switching Pulse for Ku-Band operation).

H. IP Input (TS & Data) and IP Output (TS & Data) specification

15.05.25

Sl. No.	Parameters	Specification
A	**IP Input**	
1	Format	(i) MPEG 2 TS over IP (SPTS & MPTS) (ii) RTMP stream (iii) HLS stream (iv) SRT Stream
2	Quantity for IP Input	Minimum two nos. RJ 45 if Uni-directional ports OR Minimum one no. RJ 45 if Bi-directional port
B	**IP Output**	
1	Format	MPEG-2 TS over IP on Ethernet with multiple services filtering facility and decryption.
2	Quantity for IP Output	Minimum two nos. RJ 45 if Uni-directional ports OR Minimum one no RJ 45 if Bi-directional port

I. Size

Sl. No.	Parameters	Specification
1	Mount	19" Rack Mount

5.6.1.8 Specification for 64x32 HD-SDI/ASI Routing Switcher

A. General:

The equipment should be very reliable and able to be used for selection of any one of the 64 HD-SDI/ASI input signals to all destinations. The equipment so offered should be for professional Broadcast applications. The Router has to be quoted with X-Y and Single Bus control panels.

B. Essential Features:

i. The routing switcher electronics should be capable of being mounted in a standard 19" rack frame.

ii. The switcher shall handle HD-SDI/ ASI signal for routing from input to output destinations. The switching should take place during the vertical interval period with re-clocking

iii. The switcher should have storage facilities for control information, so that in case of power supply failure, the status of the switcher output should remain unchanged when the power supply is restored.

iv. The switcher should have a built in Auto-Switch able redundant power supply.

v. The switcher quoted against this specification should be complete in all respects and should have the desired features.

vi. Any of the 64input shall be capable of being switched to any or all of 32 outputs.

Himanshu 15/5/25

C. **Technical Specification:**

Sl. No.	Parameter	Specification
1	Matrix size	64x32
2	Input	64nos. HD-SDI/ASI (BNC 75 ohms)
3	Equalization	Automatic: 150 Meters at 270 Mbps.
4	Output	32 nos. HD-SDI/ASI (BNC 75 ohm)
5	Return Loss	Should be maintained better than 15 dB up to 270 Mb/s throughout the switching chain.

5.6.2 Input Source and Downlink monitoring system

a. The input source monitoring of all the 40 SDTV channels including 16 HDTV channels and 8 Radio channel of each stream will be done on Multi-image display system. All input signal of SDTV and HDTV channel will be available in MPEG-2, MPEG-4 & HEVC compressed MPEG-2 TS over IP format on RJ45. Whereas, input signal of Radio channel will be available on SDI with embedded Audio on BNC/HD BNC. It shall have the facility to decode and display SD & HDTV channels; and Radio Channel through RTMP, HLS, SRT IP streaming.

b. The downlink signal monitoring of all the 40 SDTV channels including 16 HDTV channels and 8 Radio channel of each stream will be done on Multi-image display system. The downlink signal will be required to demodulate and descramble (CAS) the transport stream of all services (40 SDTV channels including 16 HDTV channels and 8 Radio Channels). The descrambled transport stream will be available in MPEG-2, MPEG-4 & HEVC compressed MPEG-2 TS over IP format on RJ45. It shall have the facility to decode and display SD & HDTV channels; and Radio Channel through RTMP, HLS, SRT IP streaming.

c. In addition to the above a Multi-viewer system is meant for monitoring the Ku Band DD FREEDISH downlink signals at RF Monitoring Room shall also be offered. The offered product shall be of professional broadcast quality & is able to display up to 16 or more videos simultaneously along with the corresponding audio bar graph keyed into the video and 8 Radio Channel.

d. Other physical topography is acceptable provided it meets scope of work and project objective.

5.6.2.1 Technical Specification for Professional Broadcast Quality Multi Image Display System for TV & Radio Channel

A. **Features of Multi-Image Display System:**

a) The Multi-viewer system is meant for monitoring the input sources and Ku Band DD FREEDISH downlink signals.

b) Each set of offered product shall be of professional broadcast quality & is able to display up to 40 or more videos simultaneously along with the corresponding audio bar graph keyed into the video and 8 Radio Channel.

c) Sixteen sets of complete monitoring systems are required to be provided. Eight sets monitoring system shall be configured, for monitoring of input sources (40 SD including 16 HDTV and 8 Radio channel in each set) and another Eight sets

monitoring system for Ku Band downlink signals (40 SD including 16 HDTV and 8 Radio Channel in each set) available in IP format of Transport streams compressed in MPEG-2, MPEG-4 & HEVC format. (Please see DRG: 19).

d) The product shall facilitate selection of preset window layouts of various patterns and various sizes of video images.

e) The system shall be flexible in terms of :

i) Control Multiple Screens

ii) Display the same source multiple times, in different sizes in the same or different modules.

iii) The system shall be capable of resizing the video signal and re-arranging the screen layout as per requirement

f) It shall be possible to display real time analogue and digital clocks as a substitute for any input signal into a display window

g) The offered product shall have the facility for labeling the displayed video source. The above features shall be selectable and removable depending upon the application

h) It should support 4:3 and 16:9 aspect ratios and shall be able to configure for 4:3 or 16:9 aspect ratio instantly.

i) It shall have SDI/DVI/XVGA/HDMI/DP or better output to feed the combined video to display monitor

j) The video output of multi-viewer shall be matched with the video input of the 55" display system, if not then matching adapter may be included in offer.

k) The system should have one dedicated remote control panel (RCP) for easy, quick and user friendly access for recalling the required preset layouts, selecting full screen window, and selecting the audio source for monitoring etc. In case of software based RCP the required hardware (i.e. Desktop Computer with associated accessories) should be provided in the offer.

l) The offered product should have the interfacing facility to connect an external PC for video layout configuring.

m) It should have hot swappable dual redundant power supply.

n) It should have 19" rack mounted main frame to accommodate inputs, outputs and other interfacing facilities.

o) It should have facility to store/recall at least 10 nos. of preset layouts, window sizes etc.

p) The offered solution shall be expandable.

q) The system shall provide High Video Quality with Excellent scaling, Full Frame rate. The system shall have scalability of Sources Display Devices.

r) The system shall log actions taken in a secured file and the system log should be available for export on SNMP. The Log should be kept for 7 days or more

s) The system shall provide customizable criteria for fault detection, alarm and reporting.

t) The system/solution shall be able to detect and give (i) on screen alarms (ii) Audible alarms (like beep sound or tone) and (iii) log the following faults/errors :

a) Loss of video.

15/5/25

b) Frozen video.
c) Black video.
d) Loss of audio.
e) Audio level.

u) There shall be a facility to add UMD for each and every input injected in the Video.

v) The system/solution shall have the facility to integrate multiple Multiviewer units and analyse all channels of all streams simultaneously and display Major& Minor alarms of all Input sources (at a time minimum 8 channel) in a separate monitor.

w) The screen of monitor shall be blank in case of no alarm is detected in the Input sources, whereas on the detection of alarm in any channel, the same channel shall be routed to this monitor.

x) The system/solution should have the facility to integrate multiple Multiviewer units and display the name of all channel/label multiplexed in streams in one window on a remote monitor. The colour of the channel name/label, displayed on remote monitor should be changed on acquisition of Major, Minor alarms and warning in any of the channel.

y) There shall have the facility to decode and display SD & HDTV channels; and Radio Channel received through RTMP, HLS, SRT IP Streaming.

B. Technical Specification of Multi Viewer/Image Display System Processor

Sl. No.	Parameter	Specification
1	IP Input Format	(v) MPEG 2 TS over IP (SPTS & MPTS) (vi) RTMP stream (vii) HLS stream (viii) SRT stream
2	No. of IP Port	Minimum 4 Data ports (RJ 45), 1 Gbps min. And Minimum 2 Management ports (RJ 45)
3	DVI Input	Minimum 1 No. (either directly or suitable converter/Adopter)
4	SDI with Embedded Audio Input for Radio Service	Minimum 2 Nos. on BNC
5	SD-SDI Decoder from IP stream	i) SD MPEG-2 ii) SD H.264/MPEG-4 AVC
6	SD-SDI Video Resolution	720x576 704x576 544x576
7	HD-SDI Decoder from IP Stream	i) HD H.264 Main Profile Level 4.0 8 bit ii) HD H.264 High Profile Level 4. iii) HD H.265/HEVC Main Profile level 4.0 10 bit
8	HD-SDI Video Resolution	1920x1080
9	Decoding of Audio from IP Stream	i) MPEG-1 Layer-II ii) HE AAC V1 & V2 5.1 Audio iii) Dolby Digital AC-3 5.1 Audio iv) Dolby Digital Plus 5.1 E-AC-3 Audio

15/5/25

10	Video Output	SDI (external DVI/XVGA/HDMI/DP to SDI adopter is also acceptable)
11	No of Video Output	Min 2 nos. (Independent)
12	Operating Temperature	5 to 35 degree Centigrade
13	Humidity	10 – 90% non -condensing

5.6.2.2 Technical Specification for Professional Broadcast Quality Multi Image Display System for TV & Radio Channel (for 16 SDTV and 8 HDTV for RF Monitoring Room)

A. Features of Multi-Image Display System:

a) The Multi-viewer system is meant for monitoring the Ku Band DD FREEDISH downlink signals.

b) The offered product shall be of professional broadcast quality & is able to display up to 16 or more videos simultaneously along with the corresponding audio bar graph keyed into the video and 8 Radio Channel.

c) One set of complete monitoring systems are required to be provided. The monitoring system shall be configured for monitoring of Ku Band downlink signals (16 SD including 8 HDTV and 8 Radio Channel) available in IP format of Transport streams compressed in MPEG-2, MPEG-4 & HEVC format. (Please see DRG: 16A).

d) The product shall facilitate selection of preset window layouts of various patterns and various sizes of video images.

e) The system shall be flexible in terms of :

i) Control Multiple Screens

ii) Display the same source multiple times, in different sizes in the same or different modules.

iii) The system shall be capable of resizing the video signal and re-arranging the screen layout as per requirement

f) It shall be possible to display real time analogue and digital clocks as a substitute for any input signal into a display window

g) The offered product shall have the facility for labeling the displayed video source. The above features shall be selectable and removable depending upon the application

h) It should support 4:3 and 16:9 aspect ratios and shall be able to configure for 4:3 or 16:9 aspect ratio instantly.

i) It shall have SDI/DVI/XVGA/HDMI/DP or better output to feed the combined video to display monitor

j) The video output of multi-viewer shall be matched with the video input of the 55" display system, if not then matching adapter may be included in offer.

k) The system should have one dedicated remote control panel (RCP) for easy, quick and user friendly access for recalling the required preset layouts, selecting full screen window, and selecting the audio source for monitoring etc. In case of software based RCP the required hardware (i.e. Desktop Computer with associated accessories) should be provided in the offer.

l) The offered product should have the interfacing facility to connect an external PC for video layout configuring.

m)It should have hot swappable dual redundant power supply.

n) It should have 19" rack mounted main frame to accommodate inputs, outputs and other interfacing facilities.

o) It should have facility to store/recall at least 10 nos. of preset layouts, window sizes etc.

p) The offered solution shall be expandable.

q) The system shall provide High Video Quality with Excellent scaling, Full Frame rate. The system shall have scalability of Sources Display Devices.

r) The system shall log actions taken in a secured file and the system log should be available for export on SNMP. The Log should be kept for 7 days or more

s) The system shall provide customizable criteria for fault detection, alarm and reporting.

t) The system/solution shall be able to detect and give (i) on screen alarms (ii) Audible alarms (like beep sound or tone) and (iii) log the following faults/errors :

f) Loss of video.
g) Frozen video.
h) Black video.
i) Loss of audio.
j) Audio level.

u) There shall be a facility to add UMD for each and every input injected in the Video.

v) There shall have the facility to decode and display SD & HDTV channels; and Radio Channel received through RTMP, HLS. SRT IP Streaming.

B. Technical Specification of Multi Viewer/Image Display System Processor

Sl. No.	Parameter	Specification
1	IP Input Format	(i) MPEG 2 TS over IP (SPTS & MPTS) (ii) RTMP stream (iii) HLS stream (iv) SRT stream
2	No. of IP Port	Minimum 2 Data ports (RJ 45), 1 Gbps min. And Minimum 2 Management ports (RJ 45)
3	DVI Input	Minimum 1 No. (either directly or suitable converter/Adopter)
4	SDI with Embedded Audio Input for Radio Service	Minimum 2 Nos. on BNC
5	SD-SDI Decoder from IP stream	i) SD MPEG-2 ii) SD H.264/MPEG-4 AVC
6	SD-SDI Video Resolution	720x576 704x576 544x576
7	HD-SDI Decoder from IP Stream	i) HD H.264 Main Profile Level 4.0 8 bit ii) HD H.264 High Profile Level 4. iii) HD H.265/HEVC Main Profile level 4.0 10 bit
8	HD-SDI Video Resolution	1920x1080

9	Decoding of Audio from IP Stream	i) MPEG-1 Layer-II ii) HE AAC V1 & V2 5.1 Audio iii) Dolby Digital AC-3 5.1 Audio iv) Dolby Digital Plus 5.1 E-AC-3 Audio
10	Video Output	SDI (external DVI/XVGA/HDMI/DP to SDI adopter is also acceptable)
11	No of Video Output	Min 2 nos. (Independent)
12	Operating Temperature	5 to 35 degree Centigrade
13	Humidity	10 – 90% non -condensing

5.6.2.3 Technical Specification for DVB-S & DVB-S2 Demodulator

The demodulators will be used in downlink monitoring chain. The chassis should consist of multiple modules. The module should essentially meet the following specs:-

Sl. No.	Parameters	Specification
DVB-S Demodulator		
1	Standards:	EN 300 421 (DVB-S),
2	Input Frequency Range	950 - 2150 MHz
3	No. of Inputs per module	1 or more independently tunable
4	Decoding	RS
5	Symbol Rates	5 to 40 M symbol/sec for (DVB-S)
6	FEC DVB-S	R= 1/2, 2/3, 3 /4, 5/6, 7/8
7	LNB Signaling	LNB voltage + 22KHz continuous tone
8	LNB Voltage	0/13/18Volts
9	Connector:	F connector
10	Impedance:	75 ohms
11	Monitoring port	1 x ASI output on BNC or DVB-ASI over IP.
12	Management	10/100/1000 Base-T Ethernet
DVB-S2 Demodulator		
1	Standards:	EN 302 307 (DVB-S2)
2	Input Frequency Range	950 - 2150 MHz
3	No. of Inputs per module	1 or more independently tunable
4	Decoding	LDPC and BCH
5	Symbol Rates	5 to 40 M symbol/sec for (DVB-S2)
6	FEC DVB-S2 QPSK	R= ½, 3/5, 2/3, ¾, 4/5, 5/6, 8/9, 9/10
7	FEC DVB-S2 8PSK	R= 3/5, 2/3 , ¾, 5/6, 8/9, 9/10
8	LNB Signaling	LNB voltage + 22KHz continuous tone
9	LNB Voltage	0/13/18Volts
10	Connector:	F connector
11	Impedance:	75 ohms
12	Monitoring port	1 x ASI output on BNC or DVB-ASI over IP

13	Management	10/100/1000 Base-T Ethernet

5.6.2.4 Technical Specification of Demodulator with/and Descrambler

A. General Feature

(i) Descrambler should receive the L band input and give multi service descrambling on to MPEG-2 TS over IP output.

(ii) There should be vacant slot (CI slot) for descrambling of simulcrypt DVB-CAS (CAS) for all MPEG-2, MPEG 4 & HEVC and DVB-S & DVB S2 compliant services.

(iii) It should be possible to configure and monitor the Descrambler through Remote PC.

(iv) Descrambler should be able to generate and save logs for alarms and warning through Remote PC.

(v) A separate unit of DVB-CSA (V1 & V2) supported DVB-CAS(CAS) descrambler shall also be acceptable.

B. RF Specifications

Sl. No.	Parameters	Specification
1	Input Frequency Range	950 - 2150 MHz
2	No. of Inputs	1 (min.)
3	Satellite Frequency Band	C- Band & Ku-Band, Selectable
4	Input Impedance	75 Ohms
5	Input Connector	F-Type female
6	Input Power Range	-30 to -60 dBm per carrier
7	LNB Voltage	13V, 18V or off, 22 kHz on/off
8	De-Modulation Method	DVB-S QPSK, DVB-S2 QPSK and 8PSK
9	Variable Symbol Rates	5.0 to 40 M Symbol /sec for (DVB-S) 5.0 to 40 M Symbol /sec for (DVB-S2)
10	Convolution Inner FEC selectable	R= 1/2, 2/3, 3/4, 5/6,7/8 (DVB-S, QPSK), R=1/2, 3/5, 2/3, 3/4, 4/5,5/6, 8/9, 9/10 (For DVB-S2, QPSK) R= 3/5, 2/3 , 3/4, 5/6,8/9,9/10 (DVB-S2 , 8PSK)

C. Descrambler Specifications

Sl. No.	Parameters	Specification
1	DVB Descrambler	DVB-CSA (V1 & V2) supported DVB-CAS(CAS)
2	No of services to be descrambled per CAM module/CI slot	Maximum 8 services

15/5/25

3	Free to air services	Pass through
4	Bit rate of per TS	65 Mbps
5	Total No. of Services to be descramble per stream	Minimum 40 TV services and 8 Radio services

D. IP Transport Stream Outputs and Control Ports

Sl. No.	Parameters	Specification
1	Ethernet data port	1x 1000 Base T on RJ45 connector)
2	Output Format	MPEG-2 TS over IP
3	Ethernet Control port	1x10/100 Base T (on RJ45 connector)

5.6.2.5 Technical Specification for Professional Broadcast 55" LCD Video wall Display

Sl. No.	Parameter	Specifications
1	Size	55 inch typical or more
2	Backlit light	LED
3	Input	DVI, HDMI
4	Output	DVI
5	Resolution	1920x1080 or higher
6	Aspect ratio	16:9
7	Viewing angle	Horizontal: 170 degree, Vertical : 170 degree
8	Luminance	≥ 450 cd/m2
9	Contrast	1200:1
10	Bezel Size	Maximum 2.0 mm/2.0 mm (Bottom/Right) Maximum 2.0 mm/2.0 mm (Top/Left)
11	Power consumption	400W Max
12	Operation Hours	24/7
13	Mounting	Wall and stand Mounting type with mounting kit
14	Accessory	Power cord, DVI / HDMI Cable

5.7 Measuring Equipment -

5.7.1 Digital Waveform Monitor (with Video & Audio measurement facility)

A. Essential Features

Waveform monitor is to be used for performance monitoring of Base Band signals i.e. audio and Video in digital mode for PAL format. This is to be used for SDI signal measurements. The essential features are:

1. The equipment shall be able to monitor SD digital video, SD-SDI along with digital audio (embedded or AES/EBU) and HD-SDI with dolby digital (AC-3) 5.1 Audio Channel.

2. The equipment shall be able to provide total solution for SD-SDI and HD-SDI signal monitoring.
3. The equipment shall have dual input support.
4. The equipment shall have capabilities of carrying Waveform monitor &Vectroscope, Picture display, eye pattern diagram, SDI format analyzer, SDI jitter application, Lip Sync etc .
5. The equipment shall have capabilities to display Parade and Overlay displays with interpolated waveforms.
6. The equipment shall have capabilities to numerical & Graphical display of A/V delay.
7. The measuring equipment shall be able to take both vertical Interval and full field measurements.
8. The equipment shall have dual limit verification system employed to generate a caution or alarm system when either limit is violated.
9. It shall have Graphic display of Amplitude and timing measurement, linear and nonlinear distortion measurements.
10. The equipment shall have real time format analyzer with event logging and frame capture.
11. The equipment shall have fully remote control option facility.
12. The equipment shall have facility to interface with Video wall monitoring through DVI/HDMI/SDI or IP port.
13. The equipment shall have capabilities to measure loudness & true peaks as per ITU-R BS. 1770-2 recommendations.

B. Technical Specification

i)	**SDI Input**		
1	Inputs		2; conforming to SMPTE 292M (HD-SDI: 1.485Gb/s) and SMPTE 259M (SD SDI: 270 Mb /s).
2	Input Connector	:	BNC 75Ω
3	Input level	:	800 mV p-p ± 10%
4	Return loss	:	≥ 15 dB (5 MHz to serial clock frequency)
ii)	**SDI Output**		
1	Signal	:	Serially re-clocked output of the selected input signal
2	Output connector	:	BNC 75Ω
3	Output level	:	800 mV p-p ± 10%
4	Return loss	:	≥ 15 dB (5 MHz to serial clock frequency)
iii)	**External Reference**		
1	Input signal	:	Tri-level sync signal or PAL black burst
2	Input Connector	:	BNC 75Ω
iv)	**Waveform Vertical Characteristics**		
1	**Frequency Response- HD**		
(i)	Luminance Channel (Y)	:	≤ ±0.5 % (1 MHz to 30 MHz)
(ii)	Chrominance Channel		≤ ±0.5 % (0.5 MHz to 15 MHz)
2	**Frequency Response- SD**		

(i)	Luminance Channel (Y)	:	≤±0.5 % (1 MHz to 5.75 MHz)
(ii)	Chrominance Channel	:	≤±0.5 % (1 MHz to 2.75 MHz)
3	Amplitude Accuracy	:	≤±0.5 %
4	Gain	:	X1, X5 and variable
v)	**Eye Pattern and Jitter Display**		
1	Type	:	Equivalent time sampler
2	Formats	:	HD/SD conforming to SMPTE 292M and SMPTE 259M
3	Vertical Scale Accuracy	:	800 mV ± 5 % (for 800 mV input)
4	Jitter filter	:	10 Hz, 1 KHz & 100 KHz
vi)	**Audio**		
1	Waveform Display	:	Lissajous display and surround display
2	Meter Display	:	Multi-channel Bargraph
3	Status Display	:	Dolby E metadata display
vii)	**Display**		
1	Screen type	:	LCD
2	Resolution	:	1024 x 768
3	Screen size	:	6.3" or better
4	Format	:	XGA

5.7.2 Multi format Video Generator (Test Pattern Generator)

The multi format digital signal generator is to be used for test signal generator for broadcast facilities and to test the equipment performance the essential features are:

1. The equipment shall have multi format digital (SD-SDI and HD-SDI) test signal generation facility.
2. It shall have channel configuration and performance to support reference generator needs.
3. It shall have unique, robust channel of mode to provide stable synchronization signal for digital broadcast facility.
4. It shall provide 8 channels (4 AES/EBU pairs of audio signal generation).

Sl No.	Paramcters	Specification
1.	**Audio signal**	
a)	Output Standard	ANSI S4.40 (AES3)
b)	Amplitude	1V ± 0.2V
2.	**Digital test signal (SD-SDI)**	

a)	Output Standard	ITU-R BT 601 & SMPTE 259 M
b)	Bit rate	270 Mbps
c)	Amplitude	800 mV p-p ± 10%
3.	**Digital test signal (HD-SDI)**	
a)	Output Standard	SMPTE-292M
b)	Bit rate	1485 Mbps
c)	Amplitude	800 mV p-p ± 10%

5.7.3 Technical Specifications for MPEG Real Time Transport Stream Analyser cum monitor

A. Introduction:

The equipment should be well equipped for MPEG-2 DVB Transport Stream analyser in real time with multiple serial inputs, ASI, TS packets with 188/204/208 bytes OR SSI (according to SMPTE 310M), data rate: 80 Mbit/s. The equipment should be well equipped for real time MPEG-2 TS analysis with MPEG-2/MPEG-4/H.264/H.265/HEVC elementary streams through ASI and IP input.

B. General Features:

a) It should have feature of analyzing the Transport Stream with multiple Elementary streams with a facility to see the current status of all the parameters.
b) It should support MPEG 13818-1 standard.
c) It should support complete DVB TR 101 290 standard with user defined priorities at all 3 levels.
d) It should have ASI and IP input interface to monitor MPEG-2 transport stream with MPEG-2, MPEG-4 (H.264) & H.265/HEVC elementary streams.
e) It should have DVB-S2 input interface with backward compatibility of DVB-S to do RF monitoring.
f) It should have error log facility with date and time stamping.
g) It should have alarm and special icon facility to indicate errors.
h) It should be capable of doing complete PCR analysis and displaying
i) It should have capability of triggered recording of Transport Stream.
j) It should have capability of SI/PSI/PSIP table Interpreter.
k) It should have Transport Stream Template Monitoring.
l) It should have feature of bit rate monitoring.
m) It should have capability to print error logs and graphs.
n) It should have capability to decode and monitor EPG.
o) System should be capable of getting connected to the network and controlled by central monitoring system using SNMP (Simple Network Management Protocol) protocol. Network monitoring software and Network access license must be provided along with the unit.

p) Cables and suitable adapters / accessories to monitor/analyze the digital streams should also be provided.
q) The equipment shall have facility to interface with Video wall monitoring through DVI or IP port.
r) The offer equipment should either have an integrated color monitor or should be supplied with external monitor along with KDM switch.

C. Technical Specifications:

i. ASI interface:

(a)	Input	BNC
(b)	Number of Input	One
(c)	ASI bit rate	80 Mbps minimum
(d)	Data format	Must accept both Burst and Packet mode ASI format
(e)	Signal Amplitude	2 Vp-p Maximum; 200mVp-p Minimum
(f)	Termination	75Ω nominal
(g)	Return Loss	10 dB min, 5 MHz to 270 MHz

ii. DVB-S2 Interface:

(a)	Input Frequency Range	950 MHz to 2150 MHz
(b)	Input Signal Amplitude Range	-60 dBm to -30 dBm
(c)	Modulation Format	QPSK, 8PSK, accordance with DVB-S2 (ETSI EN 302307)
(d)	MER (Modulation Error Ratio) with Equalizer (i) Display Range (ii) Accuracy	 10 to 25 dB ± 2 dB typical for range of 10 to 20 dB
(e)	CNR (Carrier to Noise Ratio) /SNR (Signal to Noise Ratio (i) Display Range (ii) Accuracy	 10 to 30 dB ± 2 dB typical for range of 10 to 28 dB
(f)	RF Constellation should be logged.	

5.7.4 Technical Specification for Real Time Signal Analyzer-

A. Essential Features.

i. The instrument shall be rack mountable, AC operated and supplied with all accessories like input probes, cables, Adapters and power cords etc. It may be

standalone unit or a system consisting of Real Time Signal Analyzer alonwith external Server, Display monitor, key board, mouse etc.

ii. The instrument shall have full set of marker functions including delta Marker, peak search marker, centre marker and multi marker (≥ 6) etc.

iii. The instrument shall have time and Data storage functions with internal memory to store minimum of 500 traces and 500 measurement setups.

iv. The instrument shall be programmable for automatic measurements.

v. The instrument shall have inbuilt self Test function or auto-calibration function.

vi. The instrument shall have facility to display carrier in carrier.

vii. The equipment shall have suitable software for transfer of screen shot measurement data to PC or Laptop.

viii. The offered signal analyzer shall have over all accuracy of ≤ 3.0 dB.

Sr. No	Parameters	Specifications/Features
1	Frequency Range	9kHz to 26.5 GHz or better
2	Aging Rate	< ±1 x 10-7/ year
3	Temp. stability (5 to 40deg.C)	<± 3 x 10-7
4	Frequency span	0 Hz - (Zero Span), 1KHz to 26.5GHz or Better.
5	Minimum Acquisition Bandwidth	100 MHz
6	Spurious-Free Dynamic Range	-70 dBc or better Or 100dB or Better
7	Displayed Average Noise Level (With Pre Amp. On)	Better than -150dBm/Hz for entire range of frequencies from 10MHz to 26.5 GHz
8	SSB Phase Noise at 1GHz frequency	10kHz offset: <-102dBc/Hz 100kHz offset: <-106dBc/Hz
9	Third order intercept point	Better than +10 dBm across specified frequency range
10	RBW and VBW	1Hz to 3MHz (3dB), in 1-3 sequence or 1Hz to 3MHz (3dB), (10% steps), 4, 5, 6, 8 MHz
11	Spectrum Display capabilities	(a) Display transients of a minimum event duration of 6µsec length shall be displayed in the frequency domain with span up to acquisition bandwidth (b) Spectrum computation of >250,000 FFTs per second

		(c) Shall provide an understanding of Time-varying RF signals with colour-gradation based on frequency of occurrence.
		(d) shall have persistence feature to capture rare interference kind of rare events and retain all updates on the screen with colour gradation
12	Trigger capabilities	Modes: Free Run, Triggered- Continuous or Single.
		Sources: RF input, External Trigger input
		Position: Settable from 0 to 100% of total acquisition length
13	Acquisition Length/Time	Min. 50 msec to 5 sec at Acquisition Bandwidth or Equivalent
14	Spectrogram Display	(a) Spectrogram shall be available. (b) Facility to provide information about Frequency, level and Time duration of the occurance of an event simultaneously.
15	Modulation Analysis	Modulation Types: DVBS(QPSK), DVBS2 (8PSK), 16QAM, 64QAM, 256QAM.
		Numerical Measurements: Error Vector Magnitude (EVM) (RMS, Peak), Modulation Error Ratio (MER), Magnitude Error (RMS, Peak), Phase Error (RMS, Peak), Origin Offset, Frequency Error, Gain Imbalance, quadrature Error.
		Displays: Constellation Diagram, EVM vs. Time or Symbol, Magnitude vs time or Symbol, Phase error vs time or Symbol, Demodulated IQ vs. Time or Symbol, Symbol Table (Binary or Hexadecimal), Eye Diagram, Trellis Diagram, Frequency Deviation vs. Time or Symbol
		100 MS/s OR better for up to maximum Acquisition Bandwidth
16	Frequency domain Measurements	Channel Power, Adjacent Channel Power, Occupied Bandwidth, dBm/Hz Marker, Burst Power
17	Automated Pulse Measurements	Time & Power measurements: Average-On Power, Peak Power, Pulse Width/Pulse Duration, Repetition Interval (Hz)/ Pulse Period, Duty Factor (%) etc
		Displays: Pulse Statistics/Characteristic
18	Display	Integrated TFT/TFT Colour display with Touch screen interface. (internal /external). In case of External display, it shall be Industrial Monitor of size 14 inches (min).

19	User Interface and Memory	- Windows/Linux OS. - Ethernet or LAN -RJ45 & USB port connectivity. - Mouse and Keyboard. - Internal or External, HDD and/ or SSD to store IQ data, set-up files etc.

5.7.5 Technical Specification for Spectrum Analyzer

A	**Essential Features**
i)	The instrument should be bench top, rack mounted model, AC operated and supplied complete with all accessories like input probes, Cables, Adapters and power cords, etc.
ii)	The instrument should have full set of marker functions including delta Marker, peak search marker, Zone marker, centre marker, multi marker (≥6nos) and features like Spectrogram, Zoom/Zone Span.
iii)	The Instrument should have time and Data storage functions with internal memory to store minimum of 500 traces and 500 measurement setups.
iv)	The instrument should have remote control operation facility and should be programmable for automatic measurements with pre installed operating System preferably Windows.
v)	The instrument should have auto-calibration function.
vi)	The Spectrum Analyser should be capable of making following measurements and display results:
a)	Noise power (in dBm / Hz or dBm/ Ch,)
b)	C/N (in dBc/ Hz or dBc/ Ch.)
c)	Occupied Band Width and Adjacent channel power
d)	Average power of burst signal
e)	Spurious Emission
g)	Frequency Counter (min. resolution: 0.001Hz)
h)	2-tone, 3rd order intermodulation distortion
i)	Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Amplitude Probability Distribution, Spectrogram
k)	Spectral Emission Mask with Limit Lines
l)	Offered Spectrum Analyser should be able to analyse DVB-S(QPSK) , DVB-S2(8PSK) Modulations as used for satellite communication at Earth Stations. It should be able to provide following measurement trace modes for: -Constellation, EVM vs Symbol, Equalizer Amplitude, Equalizer Phase, Equalizer Group Delay, Equalizer Impulse Response, Custom Numeric, Magnitude Error vs Symbol, Phase Error vs Symbol, Frequency vs Symbol, Trellis, Eye Diagram, Numeric, I and Q vs Symbol, Magnitude vs Symbol, Phase vs Symbol, Signal Monitor, Symbol Table & others.

	Software provided if any for the above measurements should be perpetual license with free upgrades during warranty period and for entire life time of the equipment.	
vii)	Spectrum Analyser should have superior XGA coloured LCD/TFT Display 8 inch or better.	
viii)	The equipment should have internal (built-in) hardware and software for transfer of screen shot measurement data. USB & Ethernet/ LAN port should be provided for the remote control operation and connecting peripherals like Keyboard and printer or external PC/Laptop.	
B)	**Technical Specifications:**	
1	**Frequency Range (DC coupled)**	9KHz to 26.5GHz or better
a)	Aging Rate	$\leq 1 \times 10^{-7}$/ year
b)	Temp. stability (5 to 40deg.C)	$\leq \pm 5 \times 10^{-8}$
c)	Frequency span	0 Hz - (Zero Span), 1KHz to 26.5GHz or Better.
2	**Spectral Purity**	
a)	SSB Phase Noise @ 100KHz offset	-107 dBc/Hz @ 1GHz or better
3	**Bandwidths**	
a)	Resolution Bandwidth (3dB)	1Hz to 3MHz (3dB), in 1-3 sequence or (10% steps), 4, 5, 6, 8 MHz
b)	Video Bandwidths	1 Hz to 3MHz, in 1-3 Sequence or (10% steps). 4, 5, 6, 8 MHz
c(i)	Analysis Bandwidth	1KHz to 40MHz or better
c(ii)	Sampling Rate	50MHz or better
4	**Amplitude**	
a)	Max. Input level(continuous)	+30 dBm or better (Suitable external Attenuator can be provided to meet this requirement, if required.)
b)	Third Order Intercept Point	+12 dBm or better across specified frequency range

c)	Displayed average noise level at 0dB attenuation (RBW 10 Hz and 10 Hz VBW) at 25 GHz or Higher frequency	≤-134dBm/Hz
d)	RF input attenuation range	0dB to 60 dB in 2 dB steps (manual or automatic).
e)	Input Connector/ impedance	N type/50 ohm
f)	Total Absolute Amplitude Accuracy	≤1.0dB (Frequency @ 3GHz); ≤ 4dB @ 25GHz
5(a).	Sweep Trigger	Free run, Video, External
5(b).	Sweep Time	1ms to 1000 Sec(Span> 1KHz)
		1µS to 1000 Sec (Span = 0Hz) or time domain mode
5(c)	Sweep (Trace points)	101 to 30000 or better (Span= 0 Hz)
6	**Display**	
a.	Modes	Normal, Max/Positive Peak, Min./negative Peak, Average, RMS etc.
b.	Scales	Log Scales- dBmV, dBµV, dBµV/m, dBm, Linear Scale-V
		1dB/div to 10dB/Div. in suitable steps.
7	**Interface**	Ethernet or LAN -RJ45 & USB port.
8	**Accessories**	a) Standard accessories including Low Loss Test Port extension Cable (Min. 1 mtr length wth suitable connectors & adoptors (if required)) to connect with the RF IN port of Spectrum Analyser should be supplied from OEM. Optional accessories shall be offered to complete all the measurement applications. Additional items to be offered if required
		b) Internal Memory 40 GB or Higher.

5.7.6 Technical Specification for Video Logger

A General Features:

1. It shall be high-quality broadcast off-air recording system (TS logger (native transport stream), SDI logger and ASI logger) for 300 SDTV channel including 16 HDTV channel with 4 four stereo audio. There shall be facility to record HDTV Channel with Dolby digital 5.1 & Dolby Digital Plus 5.1 audio and one stereo audio channel.
2. It should be provisioned to record 300 SDTV channel including 16 HD TV channel through MPEG over IP port demodulated & descrambled from 20 L band D/L frequencies signal. It should also be provisioned to record 25 channel through BNC port by selecting out any of 12 SD-SDI channel, 8 HD-SDI & 12 ASI signal.
3. It should support Standard Definition video resolution broadcasts in MPEG-2 and MPEG-4 encoding and MPEG-1 layer-II (Mono and Stereo), HE AAC for audio.
4. It should support High Definition video resolution broadcasts in MPEG-4 encoding for video and MPEG-1 layer-II (Mono and Stereo) Dolby digital plus, A.C-3 (5.1) , AAC and HE-AAC audio encoding.
5. The video logger should have multiple audio tracks support.
6. It should have the facility to record automatically the content 24 x 7 and archives it for minimum 90 days and assign metadata from associated EPG.
7. The video logger server shall be in N+1 Configuration for recoding and storage of 300 SDTV channels. Each sever shall record and store the content of SDTV, HDTV and Radio Channel in any one format at any given point of time These servers shall be utilized to record and store HD TV channel and Radio Channel without any up-gradation by way of hardware and software. The number of HDTV channel shall be restricted to bit rate of audio and video signal defined in technical specification.
8. It should be an intelligent platform and web based broadcast logging solution.
9. It should be comply the media regulators requirements for closed caption, Loudness, etc
10. It should have the facility to Integrate DVB-CSA supported DVB-CAS, EPG, , etc.
11. It should have Quick access and retrieval of recorded content through web interface, GUI interface .
12. It should have facility to monitor content in live mode with logs and assign metadata to content.
13. It should have intuitive playback controls include slow-motion progress
14. It should have facility for web application without any hardware and software upgradation.

B Transport Stream recording:

1. It should have facility for transport stream monitoring (TS) that records the Transport Stream or selected programs from the Transport Stream.

15/5/25

2. It should have transport stream logging solution can record multiple MPTS/SPTS streams and record it in server.
3. Record multiple audio and multiple subtitles, DVB, Teletext, Imitext, Closed Captions, etc.
4. Exclude specific programs/PIDs or null packets from the Transport Stream.
5. Saving the TS in its original format (native) to monitor quality.

C Remote Broadcast Verification & Monitoring With Remote:

1. It should detect problems — such as loss of audio or video signal, loudness deviation monitoring, frozen picture, etc.
2. Technical Monitoring will send a real time alert, allowing administrators to be aware and solve the problems immediately and optimize their transmissions.
3. It should be able to monitor :
   - i. Automated media performance monitoring
   - ii. Configurable, real-time alerts: SMTP, email, or SMS
   - iii. Daily logs for system administrators

Technical Specification:

S No.	Description	Requirement
1	Input/Ingest supporting Port	
a	DVB-ASI	12 Nos.
b	SD-SDI	12 Nos.
c	HD-SDI	8 Nos.
d	MPEG-2 TS over IP	20 Transport streams (MPTS and SPTS)
2	Recording Bit Rate	
a	Video	256 Kbps to 10 Mbps
b	Audio	64 Kbps to 640 Kbps
3 a	Video Format	a) MPEG-2, SMPTE 259M b)MPEG-4 SMPTE-292 and c) MPEG-2 TS (MPEG-2, MPEG-4) d)MPEG-2 TS over IP (MPEG-2, MPEG-4)
b	Audio Format	MPEG-1 Layer-II Dolby Digital 5.1 and Dolby Digital Plus 5.1 audio

4	Storage Capacity for:	
a	MPEG-4, SDTV channel with MPEG-1 Layer II embedded Audio Video Bit Rate --512 Kbps Audio Bit Rate -- 64 Kbps	Minimum 90 Days in N+1 Configuration for 300 SDTV Channel
b	MPEG-4, HD TV Channel embedded with MPEG-1 Layer-II and Dolby Digital 5.1 and Dolby Digital Plus 5.1 Audio Video Bit Rate –1 Mbps Audio Bit Rate – 192 Kbps	Servers deployed for SDTV channel shall be used for HDTV channel
5	Recording Server	Rack mounted
6	Work Station for remote monitoring with required licenses	
a	CPU	Quad Core CPU or better
b	RAM	4 GB or more
c	Hard disk	250 GB or more
d	Network	Dual Ethernet Interface
e	Operating System	Windows (Windows 7 or better)
f	Management Port	100BASE-T Ethernet interface or better

5.7.7 Test, measuring and maintenance equipment for Optical Fiber and Ethernet link (copper) system-

The test, measuring and maintenance equipment for Optical Fiber and Ethernet link (copper) system should consist of following equipment along with their essential accessories like RJ45-RJ45 patch cord, charger, RJ45/11 universal coupler, required probes, 1310/1550 single-mode source, SC, ST, and LC power meter adapters, carrying case etc -

5.7.7.1 Micro-Fiber Optic end face Inspection Scope

Features-

(i) The Fiber Inspection Scope Camera should be able to verify the Fiber End Faces are not contaminated or damaged.

(ii) The equipment should have a built-in flashlight to illuminate dark areas and dense panels.

(iii) The Fiber inspection scope camera should have the autofocus for stable images in few seconds.

(iv) The equipment should have large display to view single mode and multimode fiber end face.

(v) The equipment should be able to works on patch cords and bulkhead connectors.

(vi) The equipment should support wide range of tips to support most industry standard connectors.

(vii) The equipment should have the feature of capture & zoom to see small particles.

(viii) The equipment should have rugged construction; vibration and hold drop tested to 1 meter.

(ix) The handheld test kit should be supplied in a professional and durable case.

5.7.7.2 Cleaning kit

Features-

(i) The cleaning kit should support complete solution for precision end-face fiber optic cable cleaning.

(ii) It should clean all fiber connector types and easy to use cleaning kit with no special training required.

(iii) Solvent pen precisely dispenses specially formulated fiber optic cleaning solution.

(iv) .It consist Optical Fiber Cable (OFC) cleaner cards for convenient cleaning of fiber end-faces.

(v) It should support Fiber Optics Connectors of SC;ST;FC;LC.

(vi) The solvent in the fiber cleaning pen should have a lower surface tension that allows it to envelop particles and debris, effectively lifting them the surface of the end-face as they are carried away by a fiber wipe or swab.

(vii) The cleaning kit should support with lint-free cleaning strand to ensure the end faces remain as clean as possible.

5.7.7.3 Optical Power meter for Multimode and single mode.

A- Features-

(i) Optical Power meter should do measurement for single mode and multimode.

(ii) It should allow for a non-touch solution to check for a live fiber without having to plug into ports.

(iii) The optical power meter should be calibrated for accuracy for different wavelength like 850, 1300, 1310, 1490, 1550, 1625 nm.

(iv) The automatic wavelength-sensing feature of the meter should identifies the source wavelength and sets itself appropriately.

(v) The meter should have the ability to save a reference power level, allowing a direct display of fiber loss.

(vi) The meter should have a large LCD display screen, and a USB port to upload test results to a PC.

(vii) It should have facility of easy cable-routing identification with the help of some associated tool.

B- Technical specification-

1	Optical Connector	SC;ST;FC;LC (Interchangeable cable with suitable adopter is acceptable)
2	Emitter Type	850/1300 : LED
		1310/1550 : FP Laser
		Finder Fiber : Laser
3	Emitter Wavelengths (nm)	850, 1300, 1310, 1490, 1550, 1625
4	Power Output (dBm)	-20
5	Power Output Stability(8Hours)	±0.1 dB over 8 hours
6	Power Measurement Accuracy	±0.25 dB
7	Optical Connector	Removable Adapter
8	Detector Type	InGaAs
9	Calibrated Wavelengths	850, 1300, 1310, 1490, 1550, 1625
10	Power Measurement Range	850nm : 10 to -52 dBm
		1300, 1310, 1490, 1550, 1625nm : 10 to -60 dBm
11	Resolution	Better than 0.01 dB
12	Battery Life	> 50 hours typical
13	Serial communication physical interface	USB

Himanshu Gupta 15/5/25

5.7.7.4 Portable handheld Ethernet tester

Features-

(i) The tester shall be able to Quickly test, verify and troubleshoot wired networks.

(ii) The tester should be able display graphical wire map and length test to identity common faults that occur with cabling installation.

(iii) The tester shall have touch Sensitive gesture-based display for ease of operation.

(iv) The tester shall support the blink Port light on switch to help and identify the connected switch port.

(v) The tester shall be able to test connectivity to TCP/IP network through IP configuration and ping.

(vi) The tester shall be able to test and support diagnostic Protocols Link Layer Discovery Protocol (LLDP) , Fast Link Pulses (FLP) etc.

(vii) The tester shall be able to verify Gateway and DNS server responsiveness and availability.

(viii) The tester shall be able to Install and troubleshoot PoE devices via Switch Negotiation and PoE Load test. Ethernet Alliance PoE Certified for reliable multivendor interoperability.

(ix) The tester shall support 10G performance testing.

(x) The tester should support media access for copper 10M/100M/1 G/2.5G/5G/10G.

(xi) The tester shall have inbuilt Rechargeable lithium-ion battery pack.

(xii) The tester should be able support active diagnostics with basic details like switch name, port number, VLAN name, advertised data rates and advertised duplex.

(xiii) The tester shall have USB Type-A Port and USB Type-C.

(xiv) The tester shall support cable type Balanced twisted-pair cabling, Unshielded twisted- pair, Screened twisted-pair, 2-pair and/or 4-pair.

(xv) The tester shall support PoE 802.3af/at/bt, Class 0-8 and UPOE.

(xvi) The tester shall support cable tests with pair lengths, opens, shorts, split-pairs, crossed, straight through, and wireview.

(xvii) The tester shall Support Industrial Ethernet (EtherNet/IP, PROFINET, EtherCAT, and others).

(xviii) The tester should support and generate Analog or Digital tones compatible with any industry standard toner to assist in locating cables in a wall or telecommunications room.

(xix) The tester shall support maximum length of 250 Meters.

(xx) The tester shall support Wire Map, length of each pair, Diagnose split pairs. User selectable crossover settings (Straight through, Half- crossover, Full-crossover).

(xxi) The tester should support on board result storage capability for up to 500 readings.

(xxii) The tester must be supplied with remote unit, Toning Probe, USB-C to USB-A cable, charging cable (with international adapters), Cat 6A patch cord, RJ45/11 Modular Adapter, hanging strap and carry Bag.

5.7.7.5 Fiber Optic Splicing Machine along with relevant KIT.

A- Features-

(i) Fiber Optic Splicing Machine allows the operator to prepare minimum one fibers for fusion splicing.

(ii) It should have movable min. 4-inch color LCD monitor to ensure optimum visibility in a range of conditions, even when outside under direct sunlight.

(iii) It should equipped with a mechanism linking the wind protector and fiber clamp so when wind protector opens, the fiber clamps open automatically.

(iv) It should equipped with retention clamps.

(v) It should have required accessories like splice protection sleeves packet (consist of min 1000 Pc).

B- Technical Specification

S.No.	Description		Specification
1	Fiber alignment method		Active clad Alignment or core to core Alignment
2	Fiber count can be spliced		Single fiber
3	Applicable fiber	Fiber type	Single mode optical fiber
			Multi mode optical fiber
		Cladding dia.	125µm (Typical)
4	Applicable coating	Sheath clamp	Coating dia.:1000 µm or better
			Cleave length: 5 to16mm
5	Fiber splice performance	Splice loss	ITU-TG.652:Avg. 0.03dB

			ITU-TG.651:Avg. 0.01dB
			ITU-TG.653:Avg. 0.05dB
			ITU-TG.655:Avg. 0.05dB
			ITU-TG.657:Avg. 0.03dB
		Splice time	Avg. 6 to 8 sec.
6	Applicable Protection sleeve	Sleeve type	Heat shrinkable sleeve
		Sleeve length	60 mm or better
		Sleeve dia.	Max.6.0 mm before shrinking
7	Sleeve heat performance	Heat time	60 mm mode: Avg. 25 sec.
			60 mm slim mode: Avg. 20 sec.
8	Fiber tensile test force		2.0N (Typical)
9	Electrode life		5,000 splices or better
10	AC adaptor	Input	AC100 to 240V,50Hz, Max.1A
11	Battery	Type	Rechargeable Lithium Ion
		Output power	3000 mAh(min)
12	Display	LCD monitor	TFT 4 inches (min) with touch screen
		Magnification	150 to 300x
13	Illumination	V-grooves	LED lamp
14	Interface	PC	USB 2.0 Mini B type
15	Data storage	Splice mode	Min 80 splice modes
		Heat mode	Min. 25 heat modes
		Splice result	Min. 15,000 splices
		Splice image	Min. 90 images
16	Other features	Automatic functions	Fusion control
		Sheath clamp	Open with/without Wind Protector
			Close with fiber setting
			Easy sleeve positioning clamp
		Electrode	Replaceable without tool

5.8 Power Supply System and Air Conditioning System:-

The Power Supply System consists of the following equipment:-

a. 300 KVA Air Cooled Isolation Transformer

b. 300 KVA Oil Cooled Automatic Voltage Regulator

c. 150 KVA Oil Cooled Automatic Voltage Regulator

d. 2x200 KVA UPS System

e. Automatic 3 Phase Transfer Switch 150A for HPA

f. Power Distribution Panel and Sub distribution Board(SDB) for power distribution to the various equipment chain.

g. Suitable Earthing for the power supply system.

h. 4 core & 3 core copper Power Supply Cables of various rating

i. Mains Distribution Unit

5.8.1 Technical Specifications for 200 KVA (3 phase) Uninterrupted Power Supply (UPS)

A. Introduction:

i. The specifications are for the SITC of 200 KVA (3 phase) Uninterrupted Power Supply (UPS) in 2x(1+0) parallel load sharing mode. Both UPS system should be in parallel redundant, true on-line double conversion continuous operation (defined as VFI in the IEC62040-3 UPS Specifications), solid-state Uninterruptible Power Supply (UPS) along with Battery and Isolation Transformer (at the output on each UPS).

ii. The UPS system has to operate in conjunction with the Building Electrical System and Diesel Generator to provide power conditioning, back-up power protection, and power distribution for the critical loads.

B. General Features :

The UPS should be reliable and stable in operation under Indian tropical conditions. It should have a front panel LCD display to show various parameters of the system to ease the monitoring.

The 2x(1+0), 3 phase 200 KVA UPS systems shall be capable of running in single stand-alone Parallel Mode. Both UPS system shall be identical and shall have built-in synchronization features. The Phase synchronization shall ensures that the AC voltage and frequency of two UPS systems are identical, including their phase angles. , as per the attached configurations shown in DRG. No. 23 & 24 respectively.

15/05/25

1	a) The system should be fully DSP controlled in all respects (i.e. rectifier control, inverter control, display, digital diagnostics.), solid-state type, utilizing On Line Double Conversion technology (high frequency PWM using IGBT Rectifier & inverter section). b) The UPS system should be capable of providing continuous high quality sinusoidal waveform power for electronic equipment loads. c) The UPS system should conform to voltage frequency independent technology.
2	The DSP based controller should have following characteristics: a) Diagnostic monitoring achieved by Fast Fourier Transform (FFT) of spectrum analysis. b) Adaptive control by having the speed to monitor and control the system concurrently. c) Real time generation of smooth, near optimal reference profiles and move trajectories. d) Control power switching and inverters and generate high resolution outputs.
3	a) The system should have a monitoring panel (LCD Based) with various types of fault alarms and metering functions including: 1. Output voltage, current & frequency. 2. Input voltage, current & frequency. 3. Bypass Voltage, Current & frequency. 4. Battery capacity, backup time left & bad battery indication. 5. Temperature of System, Inverter section and Rectifier section. b) The UPS system should display RMS value of load current. c) The UPS system should generate aural and visual alarm for bad Battery condition.
4	Transient Voltage Surge Suppressor (TVSS) should be provided at the input & output of the UPS System.
5	The system should have provision for controlling all the three phases individually, even in case of 100% unbalancing at the output with even 0% load on one phase. There should be no change in regulation in phase voltage with 100% unbalancing.
6	UPS should be configured for parallel redundant operation.
7	The UPS system should be capable of supplying energy to load from commercial mains without any break even in case of phase reversal at the input. It should also generate aural and visual alarm in such a case.
8	a) The system should have provision for protection against 1. Input under voltage 2. Input Over Voltage 3. Output Over Voltage 4. Output Over load 5. Output short circuit 6. Battery under Voltage 7. Over temperature 8. DC Over current

	b) The system should generate aural and visual alarms for above-mentioned conditions.
9	The system should have Controls as i. Input Circuit Breaker ii. Bypass Circuit Breaker iii. Maintenance Bypass Switch iv. Inverter ON / OFF Switch v. Alarm acknowledge switch
10	a) The system should have facility to store the Logs of the events being monitored by monitoring system. b) The UPS system should have the capability to store a minimum of last 100 events. c) The UPS should have in – built digital fault diagnostic through stored events in UPS system.
11	The battery charger should have provision of a) Monitoring battery temperature and accordingly adjusting the charging level to enhance the battery life. b) Programmable battery charging which can be programmed to enhance battery life.
12	The system should have communication port RS 232/RS485/RS422 /RJ45 and should be compatible to integrate with control computer. Suitable software for monitoring & diagnostics etc. should be supplied.
13	The UPS system output should be isolated from the DC circuit of the UPS.
14	The system that shall be quoted against this tender should be capable of running continuously round the clock, seven days a week without interruption or failure.
15	The UPS System quoted must conform to the latest international standards of safety and EMC.In general, following standards should be met: - A. Safety: IEC 62040-1 / EN 50091-1 B. Emission and Immunity: IEC 62040-2, Class A / EN 50091-2 (Class A) C. Performance: IEC 62040 –3/ EN 50091 – 3 D. CE-Marked in accordance with EEC directives 73/23 "low voltage" and 89/336 "electromagnetic compatibility"

C. **Detailed Specification**

1. System

1.	Technology:	UPS shall be designed to operate as **true on-line, double conversion DSP controlled type UPS** strictly as per the definition of IEC 62040-3 as follows:

	a) Upon Mains Restoration: Upon restoration of AC input power, the Rectifier/Charger should automatically restart walk-in and gradually take-over the supply to inverter and charging to the battery. **b) Static Bypass:** Each UPS Module should have in-built 100% rated static Bypass Line. All the loads should be transferred to the Static Bypass Line of the UPS without any break if the input frequency is within 50 Hz and with a break below 20 milliseconds if the input frequency is beyond 50 Hz for the following conditions: i. If both the UPS fails simultaneously ii. If overload beyond 150% for 1 minute is faced by the UPS iii. If both UPS sense over temperature (i.e. inverter exceeding 85 Deg Celsius simultaneously). iv. If both the UPS inverters are put-off	
2.	Capacity:	200 KVA at power factor 0.9 (180 KW)

2. Rectifier Section

1.	Technology	DSP Controlled IGBT Rectifier to reduce the harmonics.
2.	Input	3-phase, 4-wire plus Ground
3.	Input Voltage	400 V nominal (+ 15%, - 15%)
4.	Input Frequency	50 Hz, ± 10%
5.	Input Power factor	> 0.99
6.	Input Current Harmonic Distortion (THDi)	≤ 3%
6.	Soft start (0-100%)	10 Sec minimum
8.	DC ripple voltage	< 1%

3. Inverter

1.	**Technology**	**Fully DSP based IGBT/PWM Inverter**
2.	Output Voltage (a) Nominal:	3-phase, 4-wire plus Ground 400 V AC (nominal), 50Hz
3.	Output voltage regulation: a) 100% Balanced load b) 100% Unbalanced load c) Transient response (100% step loading) d) Recovery time to steady state (± 1%)	≤±1% ≤± 2% ≤5% ≤5 msec.

15/5/25

4.	Output frequency regulation (b) Line Connection: a) Self Connection:	± 1% (meeting input frequency range of 45-55 Hz.) ± 0.05% or better
5.	Overall Efficiency: (From I/P to O/P of the U.P.S. system)	>93% (for all loads from 50% to 100%)
6.	Output voltage Distortion: (at rated load)	< 1% linear load, < 3% non-linear load with 3:1 crest factor
7.	Audible noise level at 1 meter	74dBA maximum
8.	Overload capacity: (a) Inverter (b) Bypass Mode	Upto 110% 10 min Upto 133% 1 min Upto 110% continuously at rated current 110% to 150% 10 min >= 150% 2 seconds
9.	Computer Interface:	RS 232 Interface or Ethernet
10.	**Note: Bidder should Specify the following Parameters for quoted UPS system** i) Total system losses at nominal load (with charged battery)	

4. Battery bank and Battery

I.	Parameter	Specification
1.	Battery Bank Capacity	Minimum 216000VAH (for each UPS)
2.	No. of Battery String	1 no. for each Battery Bank (one battery bank with each UPS)
3.	DC Voltage of the battery bank	Should be Minimum 360 V
4.	Type:	2 V cells of Maintenance Free Valve Regulated Lead Acid (VRLA).
5.	Backup time:	Minimum 15 minutes (at the End of Life (EOL) of Battery) for 100 % load with each UPS system
6.	Charging Voltage	Float: 2.23-2.27 V per Cell at 27°C Boost: 2.28-2.32 V per Cell at 27°C
7.	Cutoff Voltage	1.70-1.75 V per Cell (should be Selectable)
8.	Floating Voltage regulation between no load & full load.	1% or better.
9.	Codes and standards	The supplying battery manufacturer shall be ISO 9001/14001 certified. The battery design shall be of proven technology. The manufacturer shall have 5 years of field experience. ISO-9001/14001. Certificate Copy for 'VRLA Battery' must be attached with the offer.

10.	Design	All cells within the battery string shall be of the same manufacturer and model. The cells shall be "valve-regulated" (maintenance free) type.
11.	Life	20 years designed life at 27^0 C on full float.
12.	Life Cycling Characteristics	Each battery shall be designed to provide 4000 cycles at 20% depth of discharge (DOD) at 27^0 C and 1200 cycles at 80% DOD at 27^0 C.
13.	Deep Discharge	Following an equalization charge, battery shall be capable of being recharged to rated capacity from a discharge down to zero volt per cell.
14.	Recharge Rate	The battery shall be capable of a 90% recharge within 12 hours
15.	Battery Orientation	Battery shall have front accessible terminals with clear removable covers to facilitate visual inspections and allow ease of service.
16.	Self-Discharge	The battery shall have a maximum self-discharge rate of 0.5-1.0% per week at 27°C.

15/5/25

17.	Construction/ Functional Description	**A. Plates** 1. Valve-regulated type batteries shall be lead-acid, flat pasted-plate type with lead alloy grids. 2. The positive grid alloy shall be constructed of a suitable alloy made of Lead-Cadmium-Antimony or Lead-Calcium-Tin and shall be capable of deep cycle operation with low gassing, low corrosion rate, and low water loss characteristics. 3. The negative grid shall be constructed of: Lead-Calcium Alloy.
18.	Accessories	Each battery shall be furnished with the following accessories: 1. Each battery system shall include the necessary inter-cell and inter-module connectors and terminal plates. The connectors shall be lead-tin plated copper and shall include stainless steel hardware. 2. One set of numerals (one numeral per cell) suitable for permanent attachment to cells. 3. Assembly and connection drawings. 4. Each module shall include an easily removable transparent "snap on" safety shield to cover all connectors
19.	Recycling services	The manufacturer must provide worldwide recycling services to properly dispose of spent lead-acid batteries. These services must include proper instructions for the packaging, transportation, and beneficial recycling as required meeting E.P.A. guidelines (or other applicable agencies) for the safe handling of lead-acid batteries. Documentation of disposal must be provided.
20.	The bidder should submit battery sizing calculation from Battery OEM justifying following points: a) No. of Cells b) Capacity of Cell (Ah). (By considering the K factor, efficiency of system, Temperature correction factor, Ageing correction factor, etc.) c) DC bus voltage d) The minimum required area for battery installation should also be mentioned.	

5.8.2 Technical Specification for Automatic Power/Transfer Switch for HPA system.

The unit should be self contained, compact, efficient, highly reliable and based on field proven design using modern technology.

Sl.	Parameter	Specification
	Capacity	150Amp
1	Input Voltage of sources S1/S2	400 V ± 10% (Nominal), 3 phase , 4 wire AC
2	Switched Input Phases	4 pole (3 phase +N)
3	Frequency	50Hz± 10%
4	Operating Specification	
a	Transfer Type	Break before make
b	Transfer Time	< 4 msec with synchronized source
c	Efficiency	96% or better
6	Acoustic Noise Level measured at 1 meter away	62 dBA or better
7	Maximum Installation Height without de-rating	900 mtr
8	Operating Temperature	0°C to 40°C
9	Input output connection	Terminal for connection
10	Standard	Safety : EN62310-1

5.8.3 Specification for 300 KVA air-cooled Isolation Transformer (To be used externally at input of UPS)

The Isolation Transformer should be Three Phase, naturally cooled type; housed in one steel cubical provided with cast iron wheels at bottom and should have Hooks for lifting the unit. The cubical enclosing the Isolation Transformer should have sufficient openings (doors and removable covers) for ease of operation and maintenance of the system.

Sl.	Parameter	Specification
1.	AC Input:	Delta 3-phase, 400 V ±15% (phase to phase)
2.	AC output:	Star 3-phase, 400 V ±15% (phase to phase) 230 (phase to neutral)
3.	Frequency:	47 to 53 Hz
4.	Capacity:	300 KVA
5.	Duty cycle and use	24 x7 Continuous, Indoor
6.	Common Mode Noise Rejection	Better than 110 dB
7.	Inter winding capacitance	Less than 0.005 pF
8.	Load regulation	<= 4%

9.	Insulation resistance	More than 500 Mega Ohms at 500V
10.	Terminals	Studs on fiber glass plate

5.8.4 Specification for oil cooled Automatic Voltage Regulator (300 KVA)

The unit should be self contained, compact, efficient and highly reliable for 100% duty cycle, 365 days a year and based on field proven design using modern technology.

Sl.	Parameter	Specification
1	Input Voltage Range	400 V ± 15%, 3 phase , 4 wire AC
2	Capacity	300KVA
3	Output voltage and rated operating frequency	400V +/- 1% three phase AC (230 V Phase to neutral) Voltage should be adjustable to +/-5% with control located on front panel
4	Voltage regulation	+/-1 % from no load to full load
5	Frequency	AVR should work satisfactorily with input frequency range of 48-52 Hz
6	AVR Type	Indoor, servo controlled
7	Speed of correction	20 volt per second or better
8	Metering	(i) Digital meters shall be provided with selector switches for measurement of phase to phase and Phase to neutral voltage on all three phases for input and output (ii) Digital ammeter in output on all three phases (iii) Indications , on control panel should be provided for input/ output voltage status
9	Electrical protection	Protection against overload, short circuit surge voltage due to system faults, switching operations and hotspot temperatures
10	Main selector switch	Four position heavy duty control switch shall be provided for the following operations (i) OFF- The input is cut off (ii) Test - Input is through but output is cut off (iii) ON- Input and output both are through By Pass- AVR gets isolated and input gets directly connected to output
11	Input output connection	Terminal for connection
12	Cooling	Oil-cooled
13	Manual control	Provision for manual control of each phase in case of failure of automatic controls system
14	Efficiency	90% or better

5.8.5 Specification for oil cooled Automatic Voltage Regulator (150 KVA)

The unit should be self contained, compact, efficient and highly reliable for 100% duty cycle, 365 days a year and based on field proven design using modern technology.

Sl.	Parameter	Specification
1	Input Voltage Range	400 V ± 15%, 3 phase , 4 wire AC
2	Capacity	150 KVA

3	Output voltage and rated operating frequency	400V +/- 1% three phase AC (230 V Phase to neutral) Voltage should be adjustable to +/-5% with control located on front panel
4	Voltage regulation	+/-1 % from no load to full load
5	Frequency	AVR should work satisfactorily with input frequency range of 48-52 Hz
6	AVR Type	Indoor, servo controlled
7	Speed of correction	20 volt per second or better
8	Metering	(i) Digital meters shall be provided with selector switches for measurement of phase to phase and Phase to neutral voltage on all three phases for input and output (ii) Digital ammeter in output on all three phases (iii) Indications , on control panel should be provided for input/ output voltage status
9	Electrical protection	Protection against overload, short circuit surge voltage due to system faults, switching operations and hotspot temperatures
10	Main selector switch	Four position heavy duty control switch shall be provided for the following operations (i) OFF- The input is cut off (ii) Test - Input is through but output is cut off (iii) ON- Input and output both are through By Pass- AVR gets isolated and input gets directly connected to output
11	Input output connection	Terminal for connection
12	Cooling	Oil-cooled
13	Manual control	Provision for manual control of each phase in case of failure of automatic controls system
14	Efficiency	90% or better

5.8.6 Specification for Power Distribution Panel and Sub Distribution Board

Suitable Power Distribution Panel (PDP) and Sub Distribution Board (SDB) of Industrial Grade, must be supplied and installed which will distribute the AC power to each rack of the Input (DRG No. 20, 21 & 22). Bidder shall submit schematic diagram in advance before installation for approval

5.8.7 Earthing System

a. Earth pits should consist of Copper Earth electrode (diameter 20 mm (min)), insulated copper strip/wire (75 Sq. MM (Min)), Chemical earth fill compound with fast discharge characteristics, water absorbing gel, perforated Hard HDPE pipe (diameter 40 mm (min)), funnel, water supply provision upto each earth pit (preferably from A/c condenser), 10 feet depth (min) and 1 feet diameter (min.). Earth pit should be prepared so that earth resistance is less than 1 ohms -typical depth of earth pit is 10 feet minimum. (Sample picture is enclosed at DRG No. 26)

Himanshu Goel 15/5/25

All earth pits shall be extended upto earth terminals mounted on wall with insulated copper strip (75 Sq.mm (Min)) in their respective equipment room i.e. new Compression room & Monitoring room. All equipment rack of each row shall be directly connected to Earth Terminals with insulated multi strand copper wire (25 sq mm (Min)) with copper lugs at both ends.

5.8.8 Specification for Mains Distribution Unit (MDU):

A. General Features

i) Equipment shall operate from a wide range of power supply voltages without interruption or damage.

ii) Every rack should have minimum two sets of Mains Distribution Units (MDUs), each having, inbuilt with MDU or external, dual input, single phase automatic power transfer/static switches. Each MDU shall have sequential delayed output start up, output status LED and IEC-3 pin for each equipment installed in the rack. (Please refer DRG No. 21 & 22).

iii) All Equipment which have dual power supply unit shall be connected directly from MDUs. (Please refer DRG No. 21 & 22).

B. Technical Specification

Sl. No.	Parameter	Specification
1	No. of fused outlets with IEC 3-Pin Connectors in each MDU	12 nos. or more
2	Primary Power Supply	220/240 V AC nominal, Single phase, (50 +/- 2)Hz
3	Current (Max)	16 Amp

5.8.9 Air-conditioning system

a. Air-conditioning system will be used for Earth Station Equipment shall be precision Air-conditioning system. The Air-conditioning system will be installed in RF room, Baseband and compression room, Monitoring room and Power supply & UPS room.
b. The bidder should provide and install commercial/industrial grade ductable High Sensible Heat cooling air conditioning systems for 24x 7 operation to maintain a temperature from 18°C to 20° C for the compression Room, UPS Room and AHU type in HPA Room. These 4.5 to 5.0 Ton units and 8.0 to 9.0 Ton units shall run on 3 Phase AC power supply.
c. The bidder should provide and install comfort air conditioning systems with 3 stars BEE or better rating, 2 to 2.5 Ton Tower type AC in the monitoring and other technical areas to maintain a temperature from 22°C to 27° C. The units shall run on single Phase/Three Phase AC power supply.
d. Necessary duct and AHU arrangement to meet the requirement is part of the scope of work.

6 COMPLEMENT OF EQUIPMENT:

a) The make and model/part no. of each and every equipment/item/installation material etc. should be clearly mentioned in the offered Bill of Material (BOM).

b) The suggestive Bill of Material (BOM) has been provided in **Annexure-Iof Appendix-D.** The bidder is required to provide the complete list of equipment, software and accessories etc. offered to meet the requirement as per DD specifications. The quantity of each item including sub-module, licenses etc. are to be specified clearly and compulsorily, failing which the bid is liable to be rejected summarily. The following is the proforma for the BOM:

Sr. No.	Description of the item as per specification (suggestive BOM)	Description of items offered by bidder	Quantity as per suggestive BOM	Quantity offered by the Bidder	Make Offered	Model Offered
1.	2.	3.	4.	5.	6.	7.

c) The bidder should provide the offered un-priced Bill of Material in electronic form with the priced bid for ease of technical evaluation.

7 Physical, Environmental and Mechanical Specifications of equipment

7.1 Environmental Specifications (Wherever not mentioned)

Sl. No.	Parameter	Specification
1	Operating Temperature (Indoor)	5°C to 35°C
2	Operating Temperature (For Outdoor Equipment)	-10°C to 50°C
3	Storage Temperature	-10°C to 60°C
4	Humidity (Indoor)	10 to 90% non-condensing
5	Humidity(For Outdoor Equipment)	10 to 95 %
6	Altitude	2 to 1000 m

7.2 Mechanical Specifications (Wherever not mentioned)

Sl. No.	Parameter	Specification
1	Construction	Modular approach, EIA RS-310C, 19" rack mount
2	Cooling	Internal circulation fan wherever applicable

Hemanshu Goel 15/5/25

3	Mounting	Equipment shall be rack mounted and required number of racks shall be supplied pre-wired to house all the supplied equipment.

8 GENERAL

8.1 Compliance and OEM Authorisation

a) Bidder must submit a point-by-point compliance statement in respect of all the points, sub-points and Paras laid down in this specification from page 1 in the format as indicated below along with bid .

Sr. No. of DD specs.	DD specs.	Compliance (Yes/No)	Performance fig. of equipment offered.	Deviations, in case of non-compliance	Optional items if any required to make the system Compliant to DD specs.	Features in the system offered Which exceed DD specs.	Page No.	Remarks
1	-----							
2	-----							
3	-----							

b) In addition to the above, compliance from respective OEMs (not from their Indian representatives) in respect of the equipment as listed below should necessarily be given, in respect of all the points, sub-points and paras laid down in the Technical Specification of the respective equipment in the format as given above. The OEM should necessarily record the performance figure of the equipment offered in the quote for which the compliance statement is required.

A	**Input and Base Band System**
1.	Dual/Single Channel L Band OFC Link
2.	64 x 320 L Band Router
3.	Integrated Receiver Decoders (IRDs)
4.	4.5 mtr to 4.8 mtr Receive PDA
5.	Enterprise Grade Next Generation Firewall System
6	SRT based Gateway System
B	**Digital Compression System**
1.	64x64 SDI Router
2.	Encoder
3.	IP Encapsulator cum Multiplexer
4.	16x16 ASI/SDI Router
5.	Network Management system (NMS) for compression Eqpt.
6.	EPG and PSI/SI Generator/Server
7.	NTP Server
C	**IF &RF System and Uplink Antenna System**
1	Satellite Modulator, Redundancy Switch
2	70 to L-Band Upconverter, Redundancy Switch

3	L Band to Ku band Upconverter/BUC mounted with HPA
4	Ku band High Power Amplifier
5	Uplink Antenna, Feed, ACU, BTR
6	LNA
7	Dehydrator
8	RF Equipment Control and Management System (RF NMS)
9	TLT (Ku band Uplink to L Band)
10	Ku D/L to L-Band converter
C	**Input Source & D/L Monitoring system**
1.	Demodulator with/and Descrambler
2.	Multi viewer
3.	64x32 ASI/SDI Router
4.	17 inch (nominal) TFT Monitor
5.	16 Channel Audio/Video Monitor
6.	Professional Broadcast 55" LCD Video Wall Display
D	**Measuring Equipment**
1.	Multi Format Video Generator
2.	Waveform Monitor
3	Video logger
4	Real Time Signal Analyzer
5	Spectrum Analyzer
6	MPEG Real Time Transport Stream Analyser cum monitor
D	**Power Supply**
1	UPS system
2	Automatic Voltage Regulator
3	Isolation Transformer
4	Automatic Power/Transfer Switch

c) Mere signature on a copy of Doordarshan specifications shall not be accepted as a compliance statement.

d) The compliance statement in respect of Technical Specifications of the equipment should be supported by highlighted record of these in the relevant technical literature/data sheets of respective equipment enclosed with the tender and a clear reference (with volume number and page number of tender documents) to the attached supporting document should be given in the remarks column against each & every specs. Any offer without proper supporting document of each & every specs and containing only a commercial hand out/pamphlet is liable to be rejected.

e) Data sheets in respect of all offered equipment should be submitted. Any deviation from the specification detailed in the compliance statement is to be highlighted separately. Page no. of location of data sheet should be given in page no. column of the compliance statement.

f) Offers without proper & duly completed compliance statement are likely to be rejected with the sole responsibility of bidder and no further claim/correspondence will be entertained.

g) The bidder is also required to submit authorization in respect of the equipment as listed above at Sl. No. 8.1(b) in their favour from respective OEMs (not from their Indian representatives) on their letter heads along with the bid **as prescribed in Annexure II of Appendix-D.**

Himanshu Goel
15/5/25

8.2 Documentation:

a) One set of technical manual for all the equipment are to be provided along with the tender to facilitate the technical evaluation, otherwise the tender is liable to be ignored.

b) The successful bidder will have to supply set of printed technical & user manuals along with factory test report of all the offered equipment.

c) Operation Manual for all equipment should also be supplied on DVD/USB storage with search facility.

d) All offered software should have perpetual validity and should be in the name of Doordarshan. All software backups should also be supplied on DVD/USB storage.

e) For facilitating maintenance issues, the bidder must submit the firm's self certified copies of Bill of Entry/Bill of Laden/Custom Invoice of all imported items to DG:DD.

f) The successful bidder must ensure that all Invoices bear serial numbers of equipment to meet the requirement of WPC.

8.3 Guarantee/Warranty, Material & workmanship and After Sales Service Support:

The Guarantee, warranty of material and workmanship will be covered by General Terms and Conditions (GTC) at APPENDIX-B of the Bid document except the following:

a) All the offered equipment shall be guaranteed against any manufacturing defect for a period of 5 (Five) years from the date of Commissioning.

b) Any part failing during the guarantee period shall be repaired/replaced free of charge by the successful bidder at site. For repairing of any defective equipment during guarantee period, the defective module or equipment requiring repairs will be handed over to local office/local authorized representative/ dealer who will arrange repairs locally at site or send/export the defective modules to OEM factory and re-import/send back after repairs.

c) It is the responsibility of local office/ Authorized representative/ dealer of the bidder to arrange the repair/ replacement of faulty items for Doordarshan i.e. no transportation charges would be paid by DD for transporting the defective/ repaired items, if required to be removed from site, during the guarantee period.

d) Guarantee/Warranty period of the complete system is to be extended, corresponding to the outage period from the date of acceptance,

1. if the failure rectification takes more than 30 days for equipment which needs to be sent back to out of India or needs to import spares for fault rectification. To exercise to this clause, Documentary proof like shipment/import documents etc. is required to submit as proof of import of equipment/spares for fault rectification.
2. if the failure rectification takes more than 15 days for equipment which does not need to be sent back to out of India or to import spares for fault rectification.

e) If bidder is not the OEM, then the guarantee/ warrantee in respect of the equipment as mentioned in Clause 8.1(b) shall be provided by the bidder through respective OEMs. A certificate, duly signed by the OEM on the OEM letterhead, in this regard of the respective equipment must be submitted with the offer by the bidder as prescribed in Annexure III of Appendix D.

f) If bidder is not the OEM, then after sales service support for additional 2 (Two) years for the repairs/ maintenance in respect of the equipment as mentioned in Clause 8.1(b) after the completion of guarantee/ warrantee period shall also be provided by the OEM either directly or through his representative in India. A certificate, duly signed by the OEM on the OEM letterhead, in this regard of the respective equipment must be submitted with the offer by the bidder as prescribed in Annexure IV of Appendix D.

8.4 Inspection and Commissioning:

The inspection of material will be carried out by the authority specified in the Purchase order. The material will be accepted only after the same has been found satisfactory after inspection and duly marked and sealed by the Inspection Authority.In addition to "General Terms and Conditions" (GTC) at Appendix-B of the Bid document, the inspection of material/equipment will be carried out as follows:

8.4.1 All the equipment to be supplied against this A/T (Purchase Order) for this tender shall be subjected to pre-installation inspection at Doordarshan Site by Doordarshan Officer appointed by Doordarshan Directorate. The pre-installation inspection shall be based on manufacturer's factory test results and physical verification of make and model of equipment. The successful bidder should produce the factory test reports of the offered equipment to facilitate inspection.

8.4.2 Post installation inspection and commissioning of the system will be carried out by a team of Doordarshan Officers authorized by Doordarshan Directorate and based on approved Acceptance Test Procedure (ATP).

8.4.3 A draft copy of ATP (Acceptance Test Procedure) must be submitted by the successful bidder one month in advance of the proposed date of inspection of the installed system to Doordarshan Directorate for approval. ATP should describe the standard test procedure of individual equipment and overall system. The factory test report will not be treated as ATP.

8.4.4 The approved ATP with or without changes shall be sent back to the successful bidder to be used for inspection and commissioning of the installed system by DD Engineer(s) at site. All the equipment required for the inspection as per the approved ATP are to be provided by the successful bidder.

8.4.5 The SITC certificate will be issued by the team of Officers appointed at S.N. 8.4.2 above

8.5 Delivery Period:

Nine Months from the date of issue of purchase order (A/T) or seven months from the date of issue of the decision letter from WPC and provided by DD in respect of RF equipment, whichever is later.

8.6 Pre-Bid Conference:

A pre bid conference on technical Specifications and other issues shall be held on date and time specified in the NIT. All prospective bidders may attend the pre bid conference to discuss their queries and suggestions. All the queries and suggestions should be sent to Doordarshan at least 2 days before the date of pre bid conference. No queries/ suggestions shall be entertained after pre bid conference. Amendments subsequent to the pre bid conference shall be sent to prospective bidders, who have purchased tender document by e-mail/fax/ post. It shall be bidder's responsibility to check for any amendments on Doordarshan website before submitting their duly completed bids.

8.7 Check List and Enclosures:

The bidders may ensure the following check list while submitting the bid including some important list of enclosures for ease of technical evaluation along with list of enclosures mentioned in Appendix-A, Appendix-B, and Appendix-C of Tender Bid.

(Additional Check List)			
	Description	YES/NO/NOT APPLICABLE	Remarks
1	Whether documents related to fulfilment of the eligibility criteria for Bidder and OEMs as per Clause 3 have been submitted ?		
2	Whether the BOM has been submitted in the prescribed format as given in Clause 6 ?		
3	Whether all equipment and accessories as given in Annexure-I of Appendix-D have been included in the offered BOM ?		
4	Whether the compliance statement from the bidder as required in Clause 8.1 (a) has been submitted ?		
5	Whether the compliance statements from the respective OEMs for equipment/system mentioned in Clause 8.1 (b) have been included ?		
6	Whether the Authorization (Annexure-II of Appendix-D) as required vide clause no. 8.1(g) in respect of equipment as mentioned in Clause 8.1 (b) from respective OEMs have been included ?		
7	Ensure that the relevant technical brochures/manuals containing all the parameters of technical specifications of all the offered equipment and accessories have been included with proper indexing for ease of identification ?		
8	Whether the page numbers of the relevant enclosed technical data sheet/manual against each parameter of the technical specifications have been given in the compliance statements ?		
9	Whether the requisite undertakings for guarantee/warranty (Annexure-III of Appendix-D) and after sales service support (Annexure-IV of Appendix-D) by OEMs as required vide Clause no. 8.3 have been submitted ?		
10	Whether the requisite undertakings as required by Annexure-V of Appendix-D by Bidder have been submitted ?		
11	Ensure that no alternate item has been offered		
12	Ensure that the Un-priced BOM has been included		
13	Any other item mentioned elsewhere in the tender.		

Annexure II of Appendix-D

OEM LETTER HEAD

CERTIFICATE FOR AUTHORIZATION

Date:

Tender No. :

We, M/s ..... (Name and Address of the OEM), do hereby authorize M/s..... (Bidder's name),having its office at ..... (Bidder's address) to submit the bid and sign the contract with Doordarshan for the products offered by us against the above tender.

Signature .....
Name & Designation of authorized signatory of OEM.....
Name of the OEM - .....
Stamp

OEM LETTER HEAD

CERTIFICATE FOR GUARANTEE

Date:

Tender No. :

We, M/s ..... (Name and address of the OEM), do hereby confirm that:

All the offered equipment shall be guaranteed against any defect for a period of 5 (Five) years as per terms and conditions of tender document.

1. Any part failing during the guarantee period shall be repaired/replaced free of charge by the successful bidder at site. For repairing of any defective equipment during guarantee period, the defective module or equipment requiring repairs will be handed over to local office/local authorized representative/ dealer who will arrange repairs locally at site or send/export the defective modules to OEM factory and re-import/send back after repairs.

2. It is the responsibility of M/s ----------,(their local office/ Authorized representative/ dealer of the bidder) to arrange the repair/ replacement of faulty items for Doordarshan i.e. no transportation charges would be paid by DD for transporting the defective/ repaired items, if required to be removed from site, during the guarantee period.

3. Guarantee/Warranty period of Equipment or spare parts thereof replaced is to be extended corresponding to the outage period from the date of acceptance, if the failure rectification takes more than 15 days (for equipment which does not need to be sent back to out of India or to import spares for fault rectification) or 30 days' time (for equipment which needs to be sent back to out of India or needs to import spares for fault rectification), as applicable.

4. All software being offered, are to be licensed to Doordarshan on perpetual basis without specifying any time limit or without specifying end of life of the software. Software upgrades within warranty period will have to be supplied free of cost.

Signature .....
Name & Designation of authorized signatory of OEM.....
Name of the OEM- .....
Stamp

Annexure IV of Appendix-D

OEM LETTER HEAD

CERTIFICATE FOR AFTER SALES SERVICE SUPPORT

Date:

Tender No. :

We, M/s ..... (Name and address of the OEM), do hereby confirm that after sales service support for additional **Two (2) years** for the repairs/maintenance of offered products after the completion of **Five (5) years** guarantee/ warrantee period shall be provided through our representatives/authorized dealer/service provider for the offered equipment and accessories in India as mentioned below:

S. No.	Name of the authorized person	Name & Address of authorized After Sales & Support Office/Firm	Telephone/ Fax	Email of the concerned personnel
1				

Signature .....
Name & Designation of authorized signatory of OEM.....
Name of the OEM - .....
Stamp

BIDDER LETTER HEAD

DECLARATION BY THE BIDDER

1. Bill of Material (BOM)- : [Yes/No]
2. Bidder's compliance (As per specs clause no. 8.1.(a) : [Yes/No]
3. The copy of Dealer Possession License in case of possession of RF equipment (if applicable) : [Yes/No]
4. Copy of the Memorandum of Understanding (MOU) of Consortium/Joint Venture (If Applicable) : [Yes/No]

5. OEM Compliance for following equipment from their respective OEMs (as per clause no. 8.1.(b)):

S. No.	Name of equipment	Name of OEM	OEM compliance submitted (Yes/ No)
i			
ii			

5. Certificate for Authorization for following equipment from their respective OEMs:

S.No.	Name of equipment	Name of OEM	Authorization certificate submitted (Yes/ No)
i.			
ii.			
iii.			
.			
.			

6. Certificate for Guarantee for following equipment from their respective OEMs:

S.No.	Name of equipment	Name of OEM	Guarantee certificate submitted (Yes/ No)
i.			
ii.			
iii.			
.			
.			
.			

7. Certificate for After sales service support for following equipment from their respective OEMs:

S.No.	Name of equipment	Name of OEM	After sales service support certificate submitted (Yes/ No)
i.			
ii.			
iii.			
.			
.			
.			

8. Datasheet for the offered equipment as per offered BOM: [Yes/No]

i.

ii.

iii.

Signature

.....

Name & Designation of authorized signatory.....

Name of the Bidder -

.....

Stamp

Annexure VI of Appendix-D

OEM's LETTER HEAD

CERTIFICATE FOR WORK EXPERIENCE

Date:

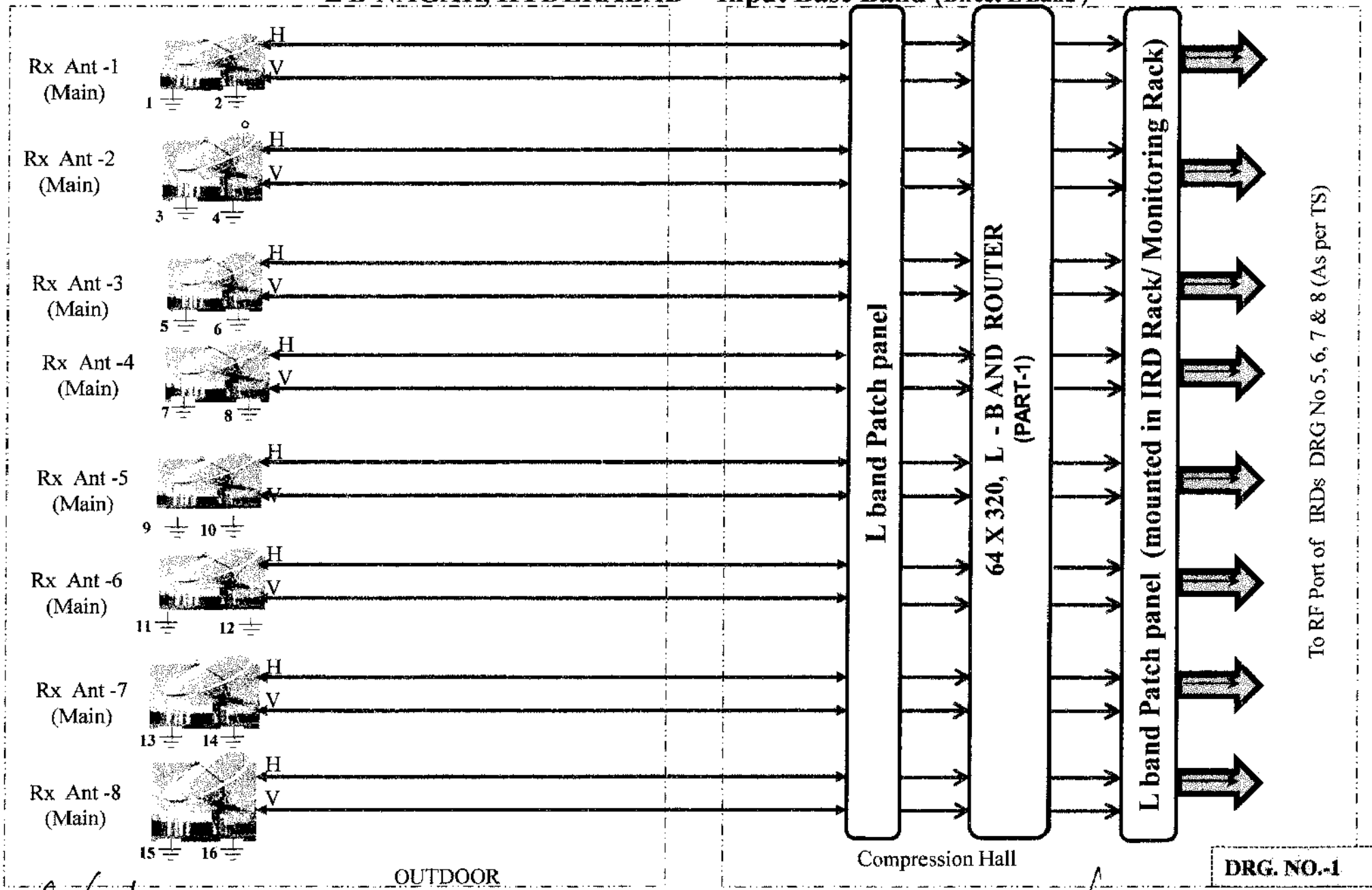
Tender No. :

We, M/s ..... <Name and address of the bidder>, do hereby confirm that details of Work Experience are as follows:

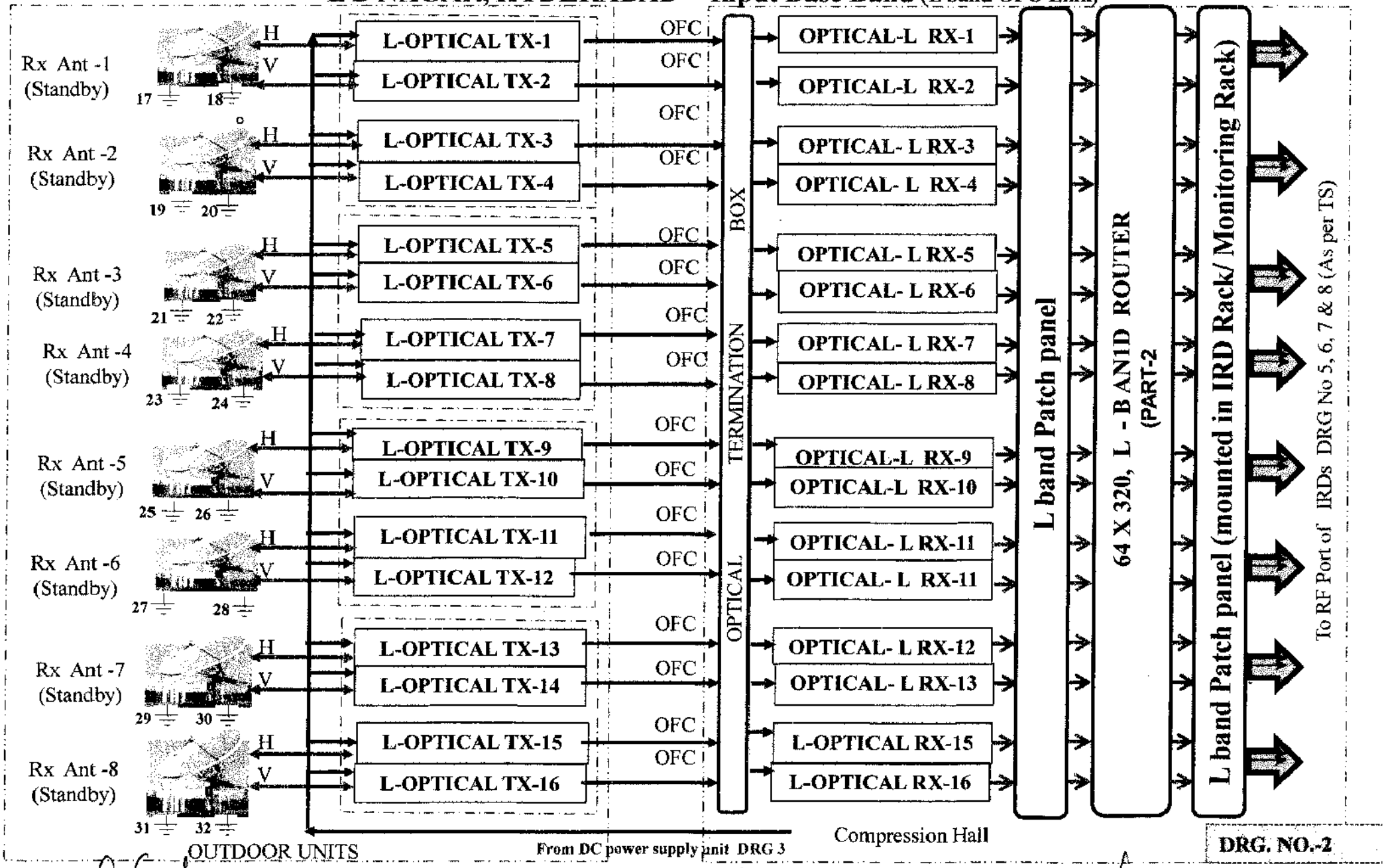
S. No	Description of Work Experience of the Bidder	Details of Work Order No. with date	Copy of Work Order uploaded with bid (YES/NO)	Work Order Value to be considered for Work Experience of the Bidder	Bidder's Work Experience Category (Please select anyone option i.e. (a) 80% or (b) 60% or (c) 40% of Estimated Cost)
1					
2					
3					

Signature .....
Name & Designation of authorized signatory of the Bidder.....
Name of the Bidder.....
Stamp of the Bidder

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (Direct L Band)

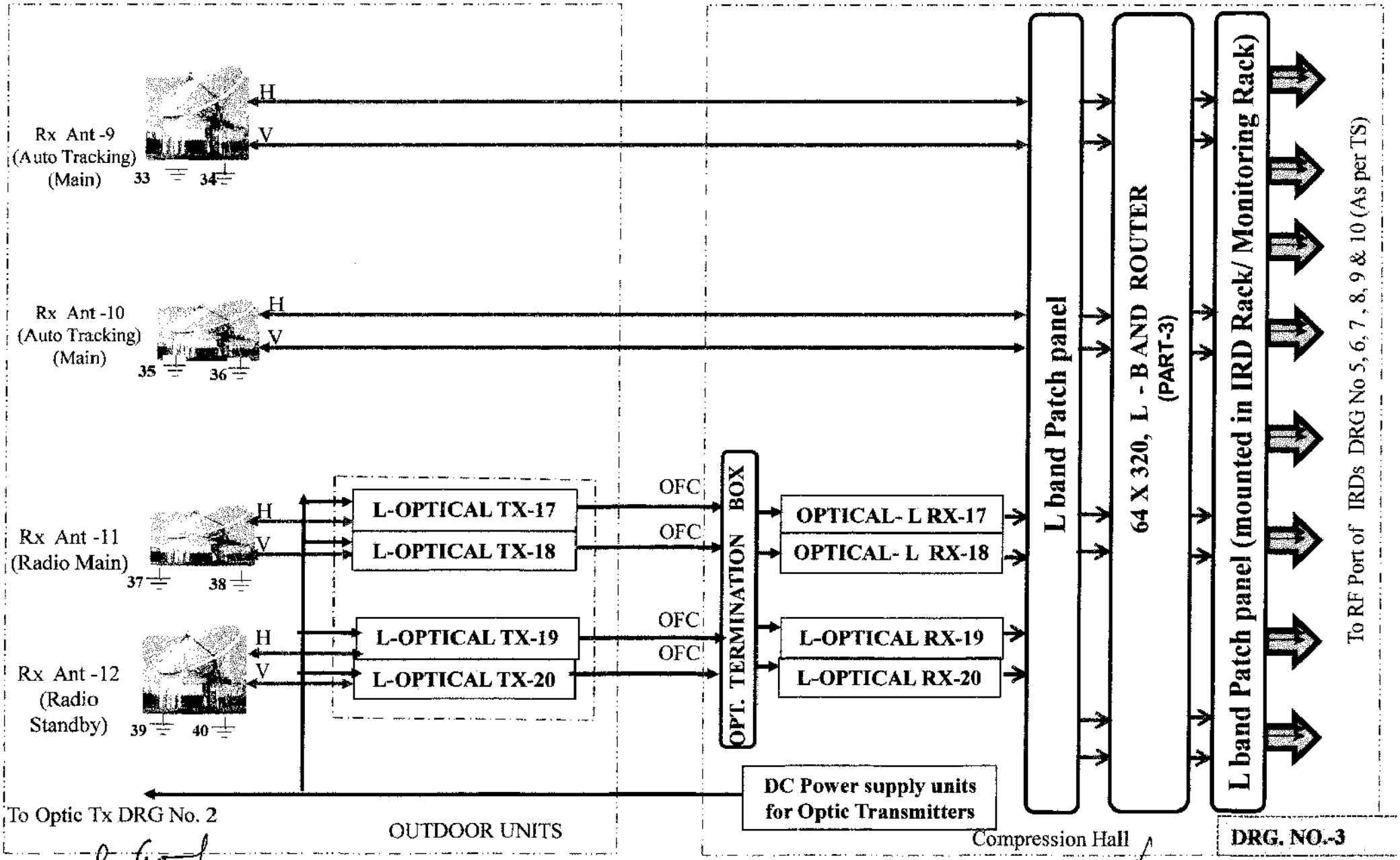


Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (L band OFC Link)



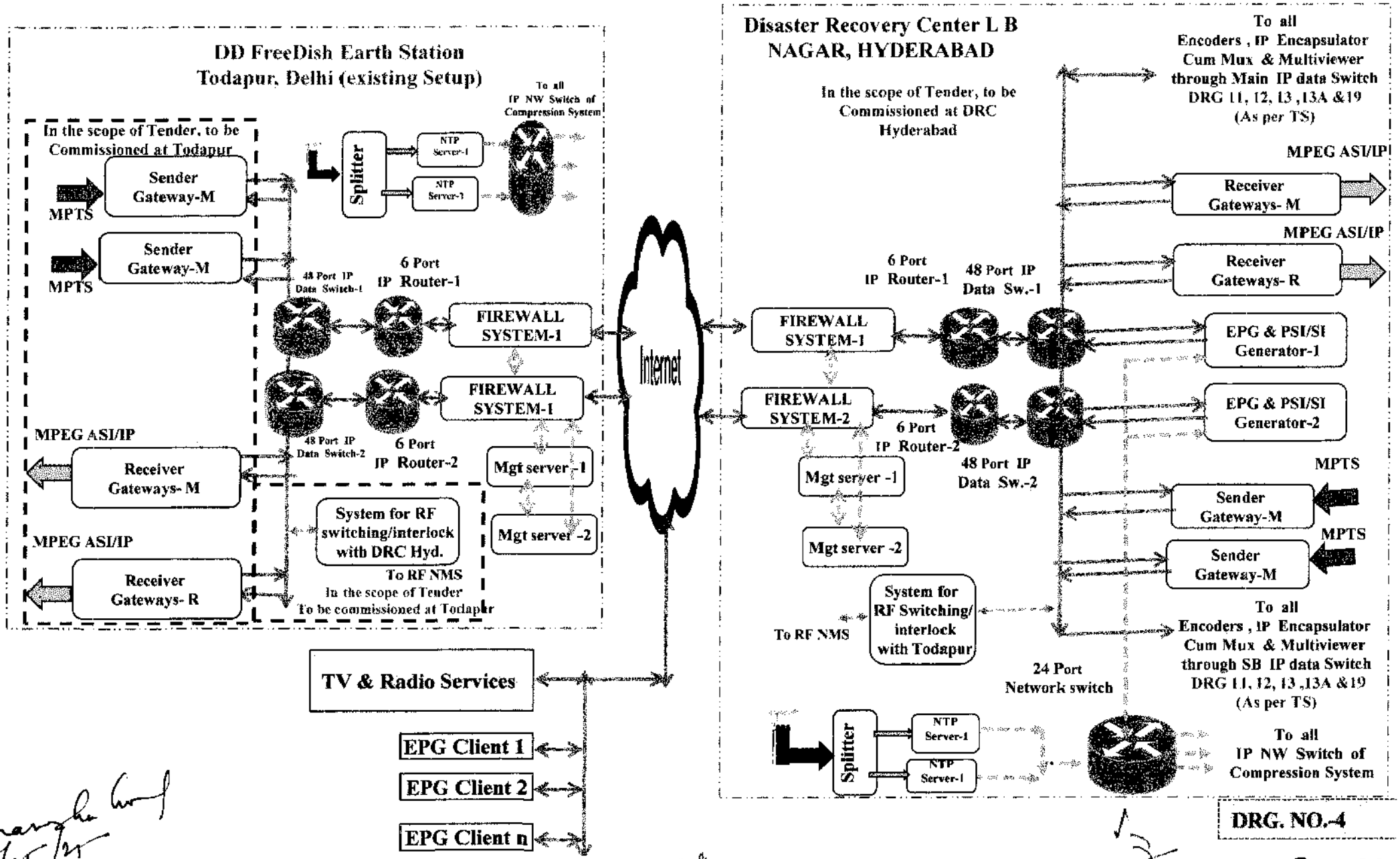
10/05/25

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (Direct L Band L band OFC Link)



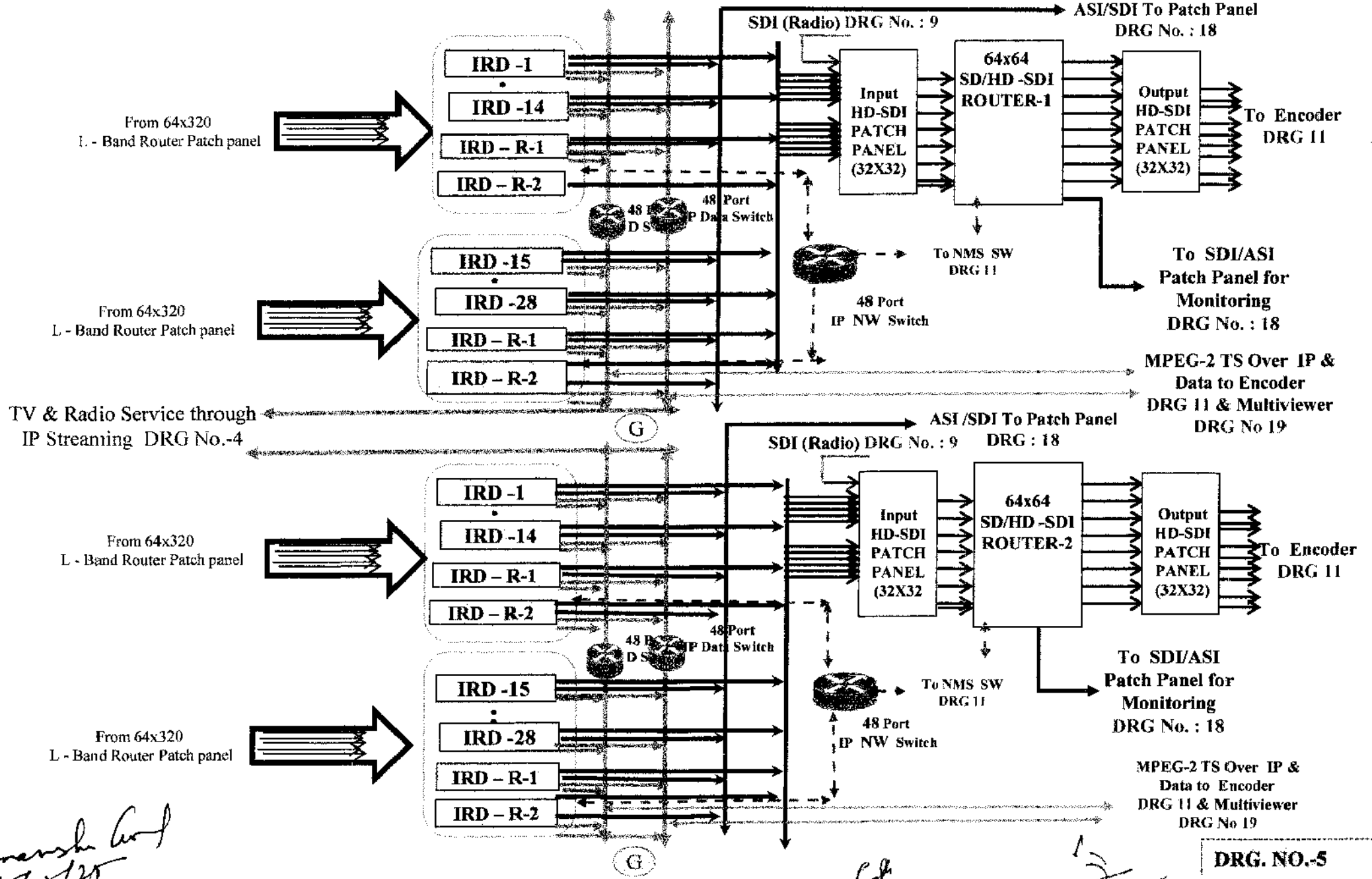
Page 152

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (EPG & PSI/SI Generator , NTP Server and IP Input Streaming for Radio Service)



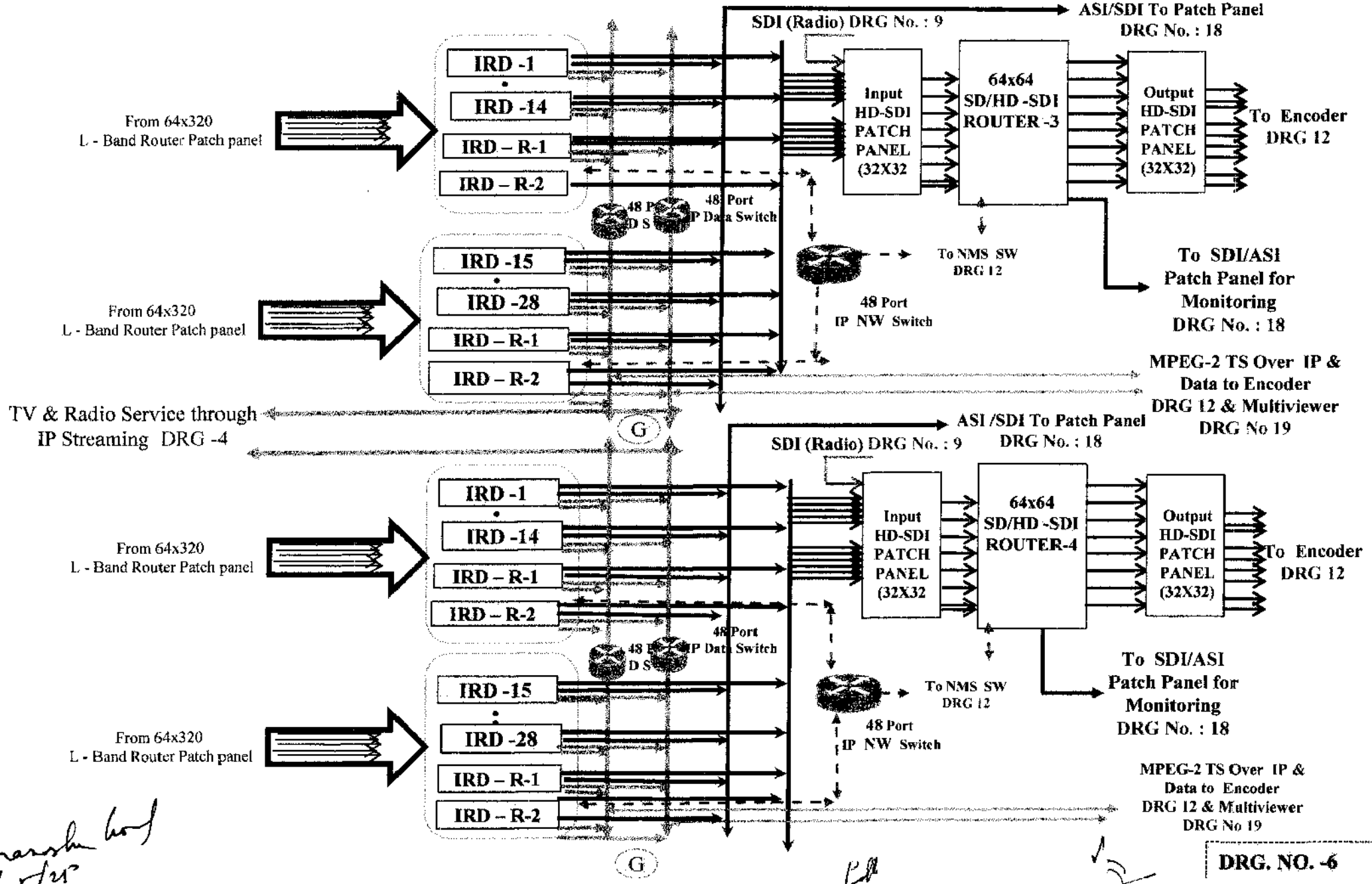
10/05/24

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (For Stream 1 & 2)



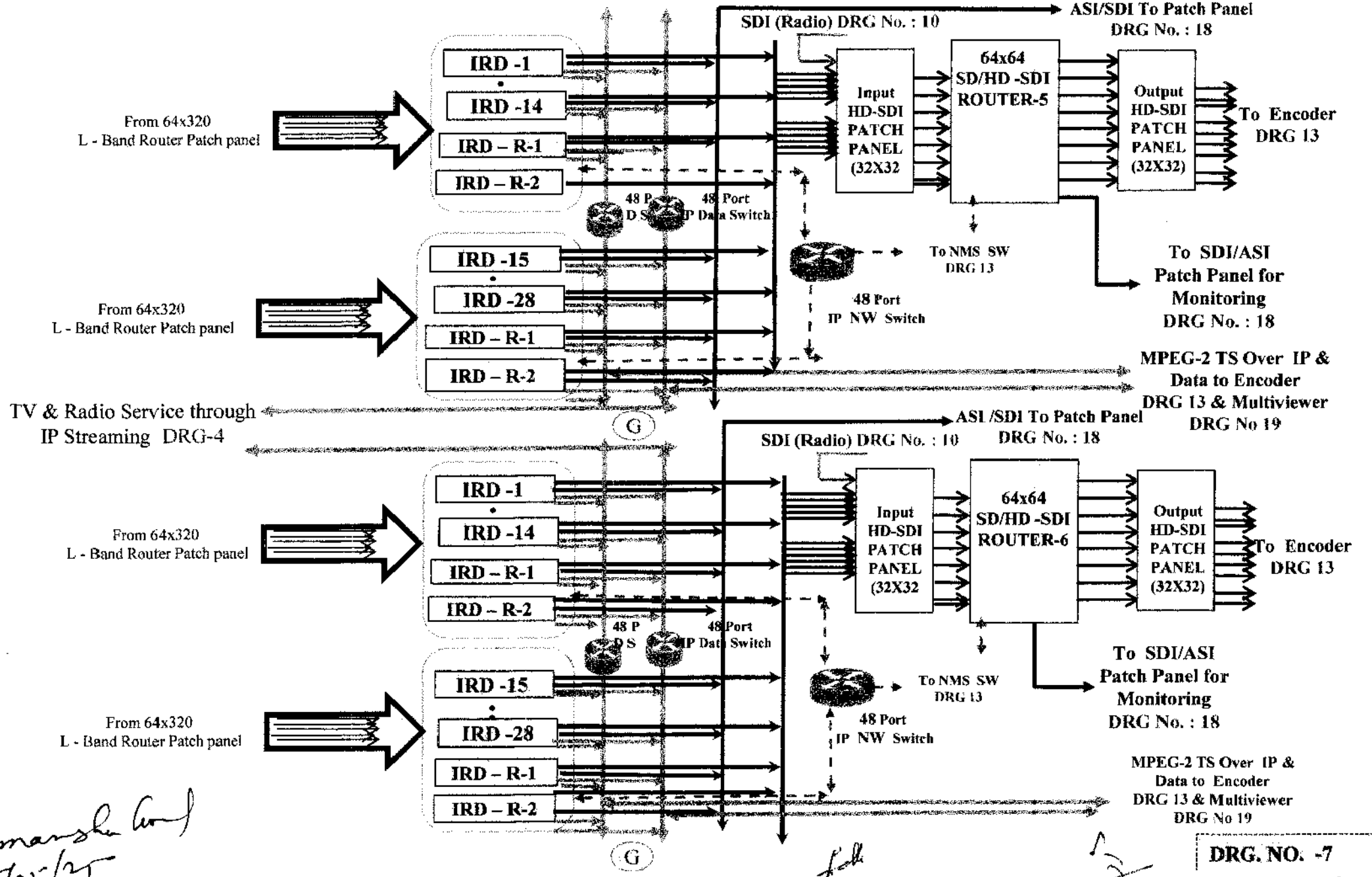
DRG. NO.-5

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (For Stream 3 & 4)



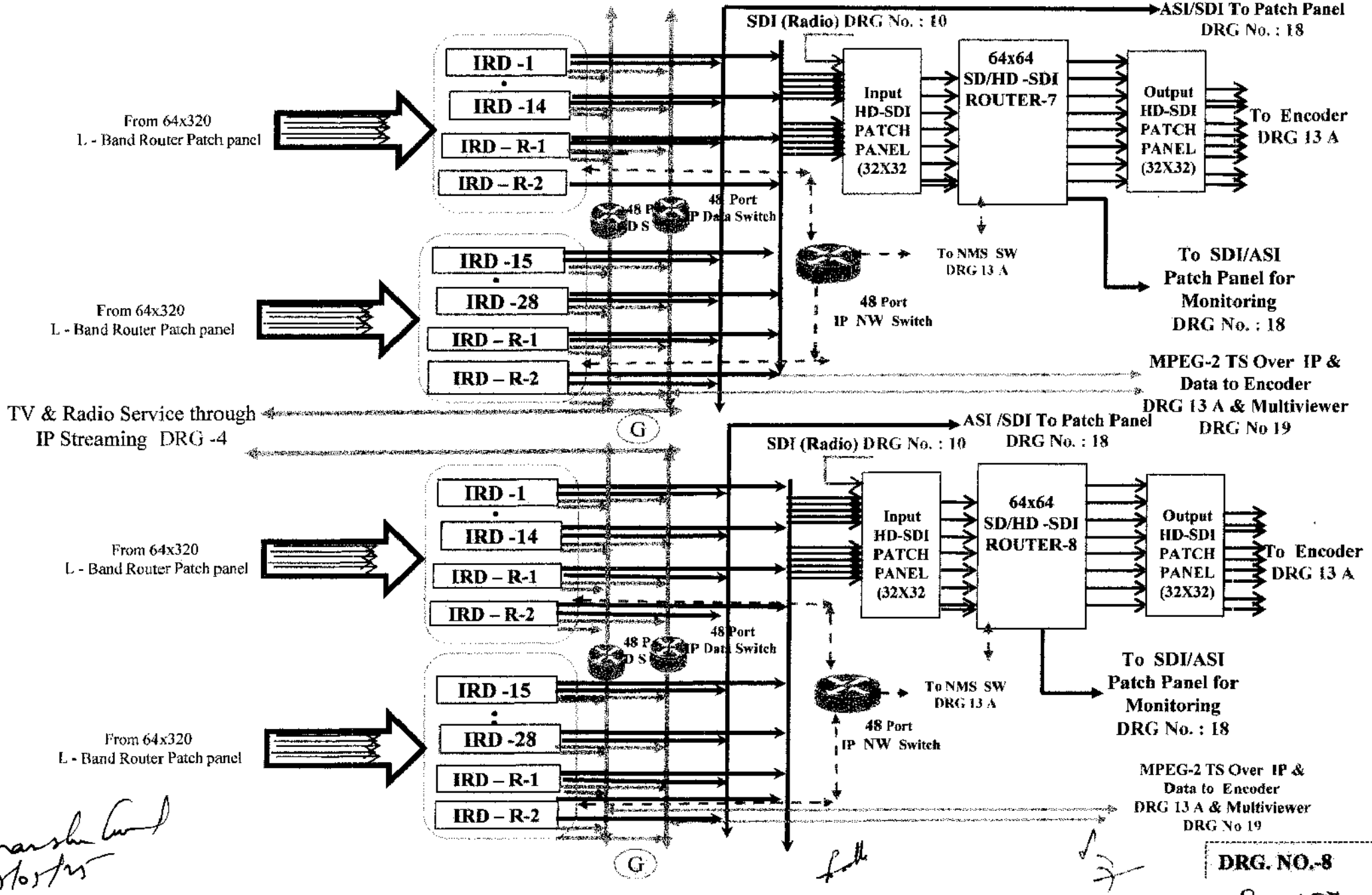
DRG. NO. -6

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (For Stream 5 & 6)



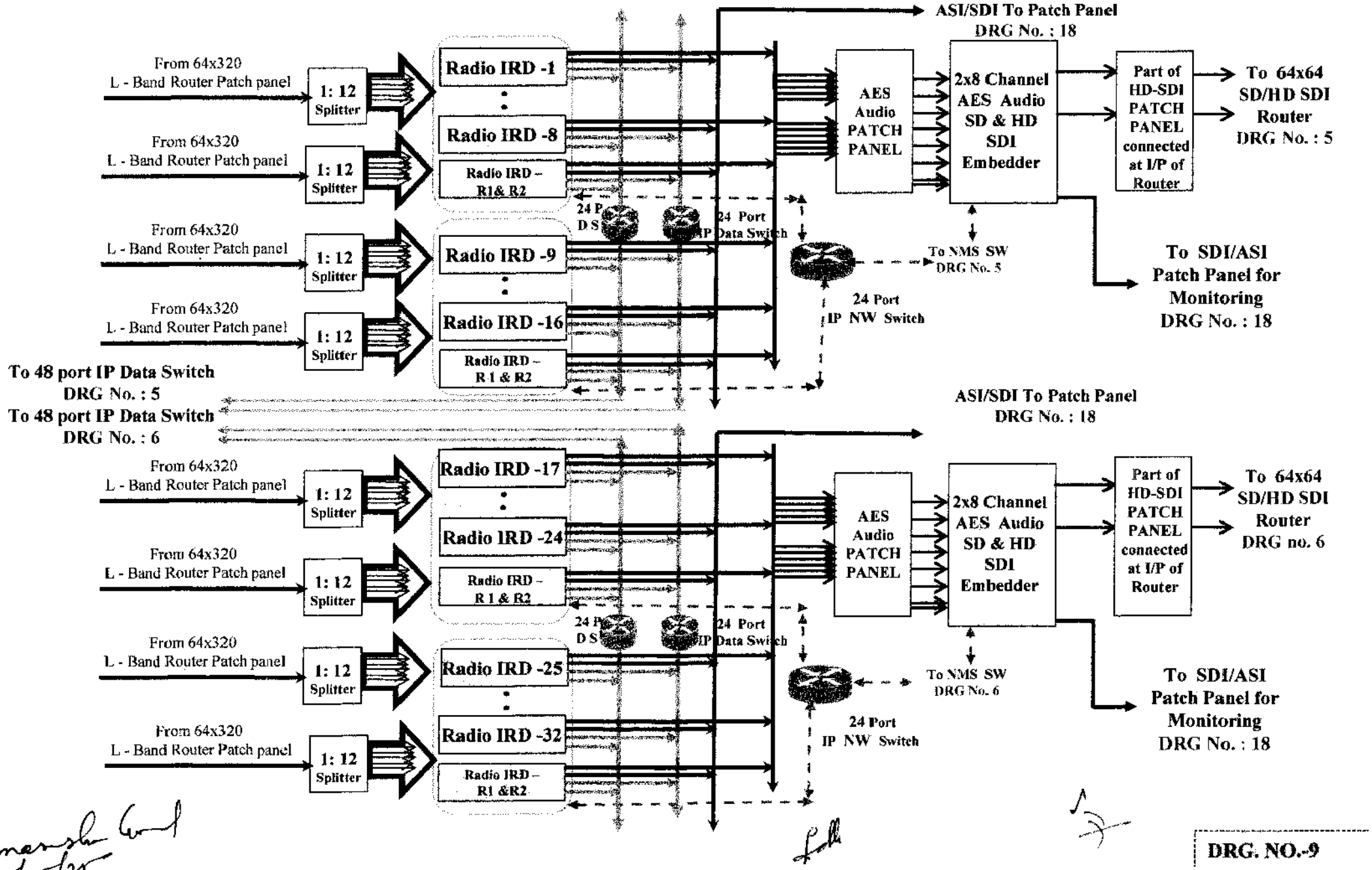
DRG. NO. -7

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band (For Stream 7 & 8)



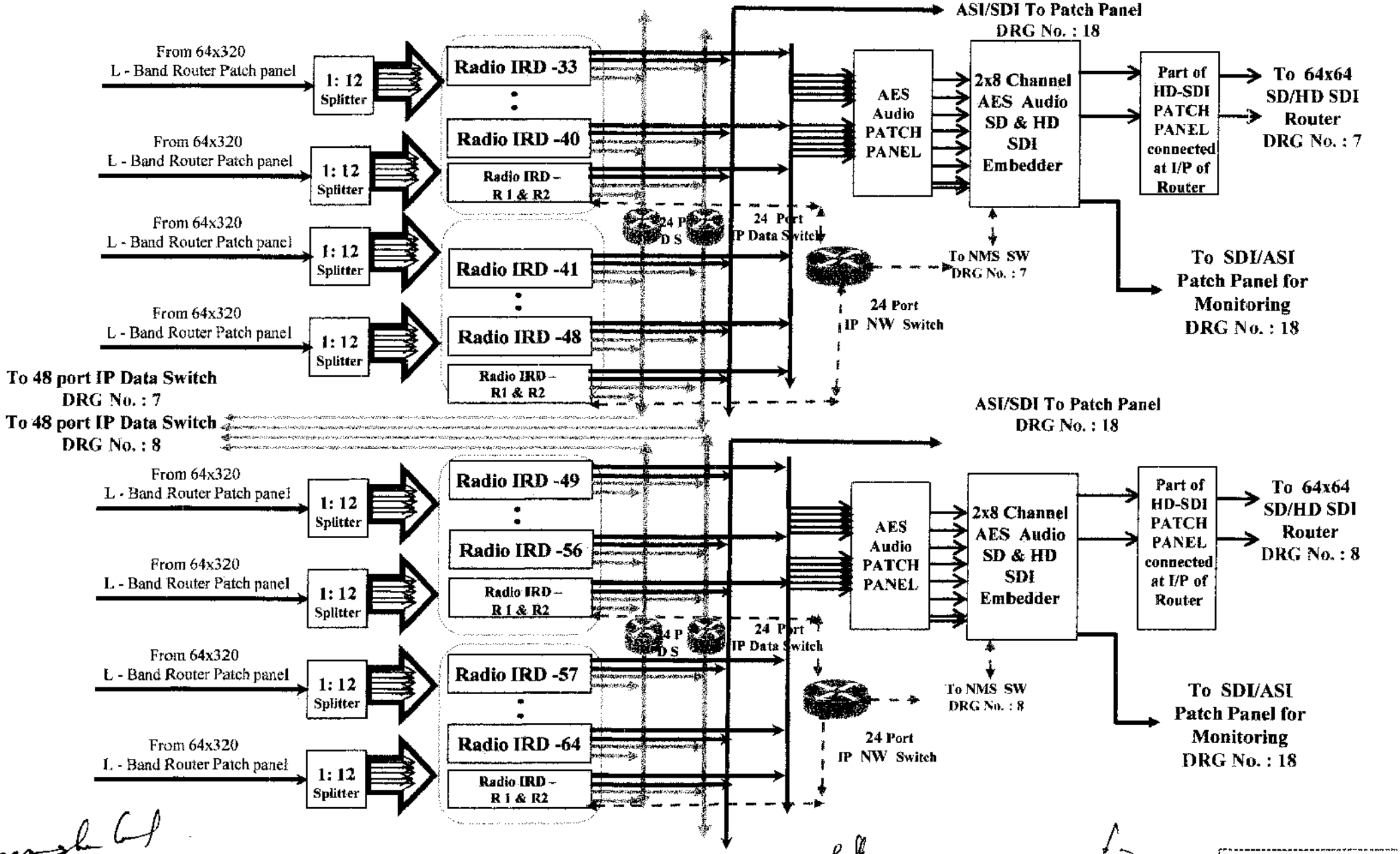
DRG. NO.-8

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band-Radio Service (For Stream 1, 2, 3 & 4)



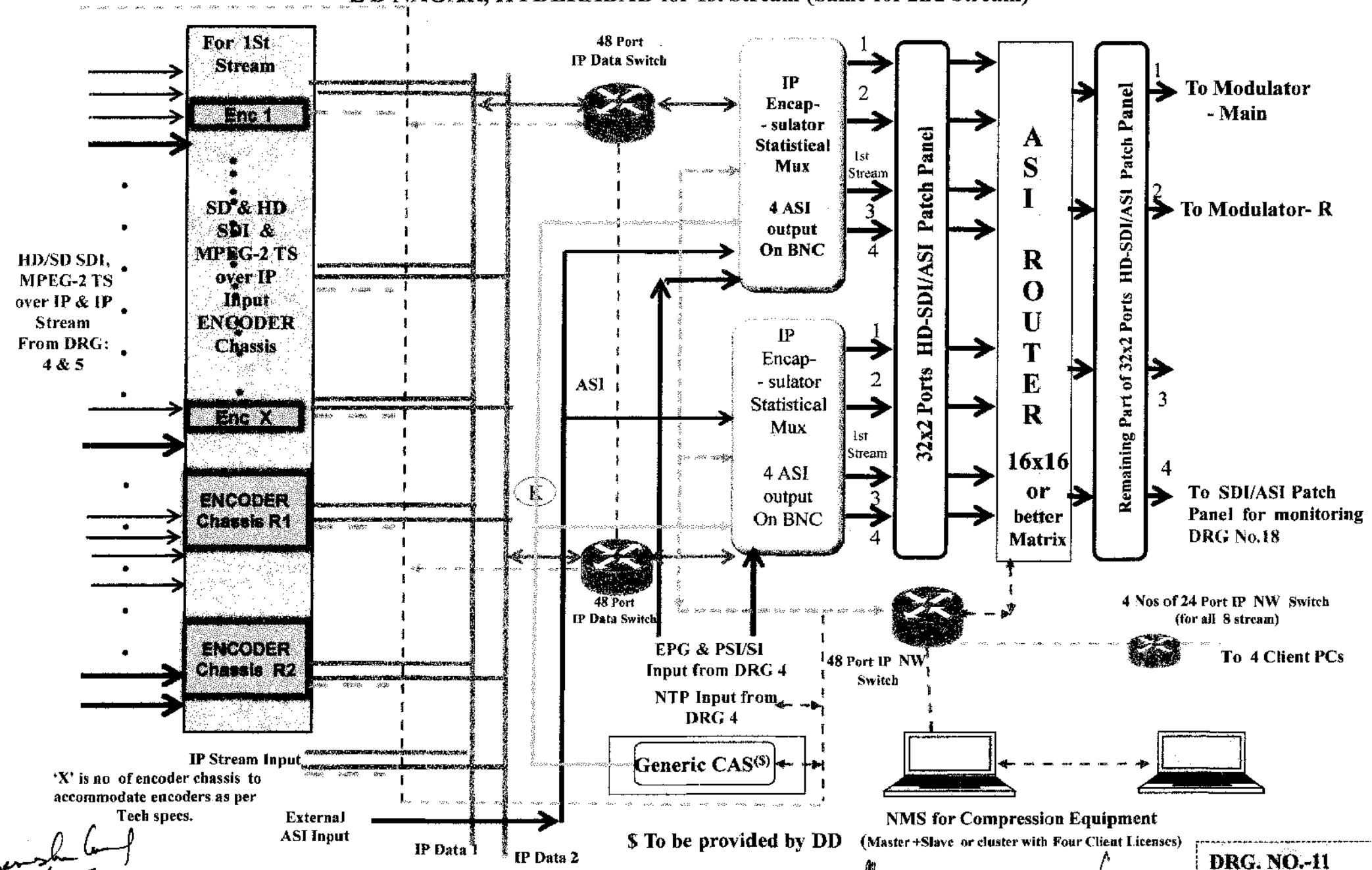
DRG. NO.-9

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - Input Base Band-Radio Service (For Stream 5, 6, 7 & 8)



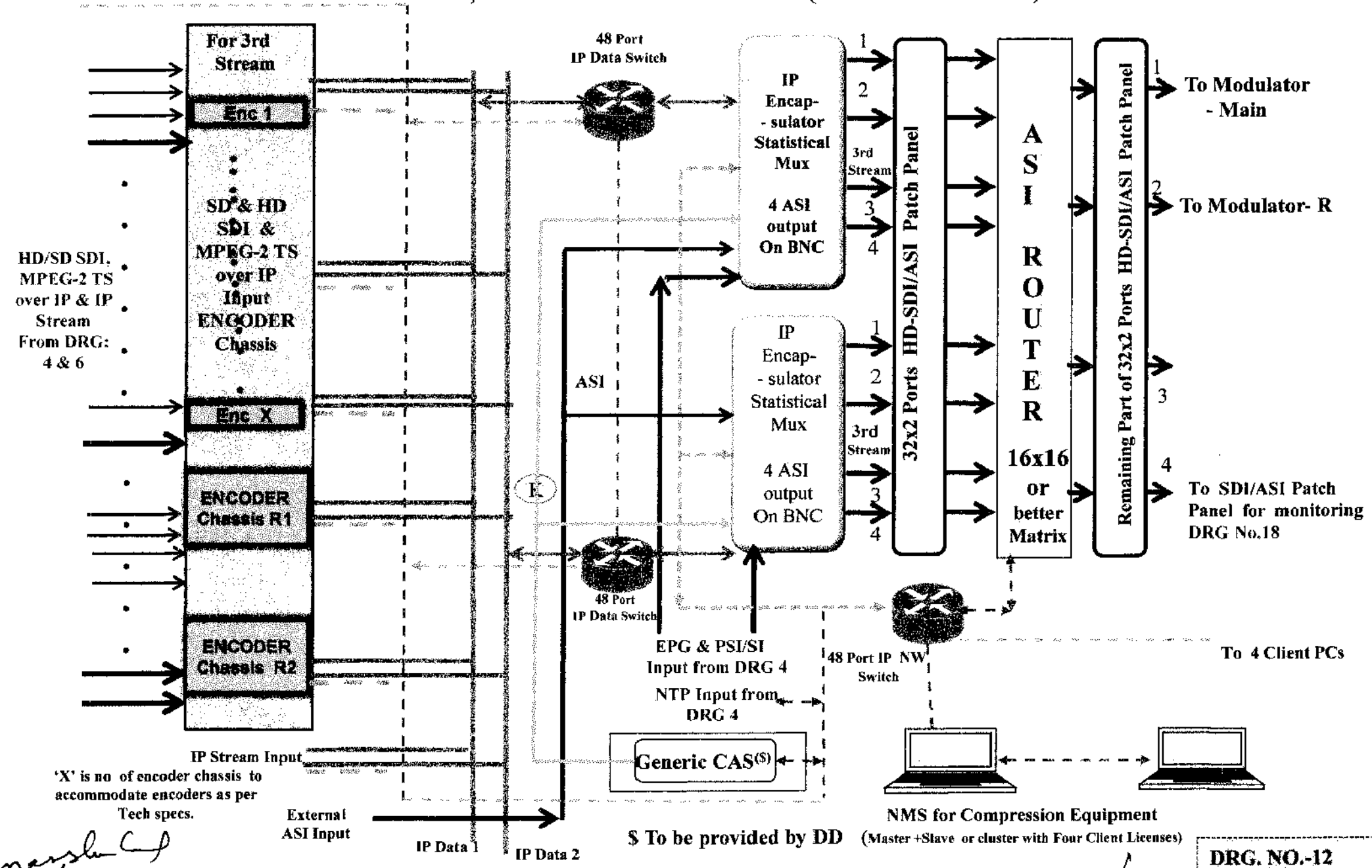
DRG. NO.-10

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD for 1st Stream (Same for 2nd Stream)



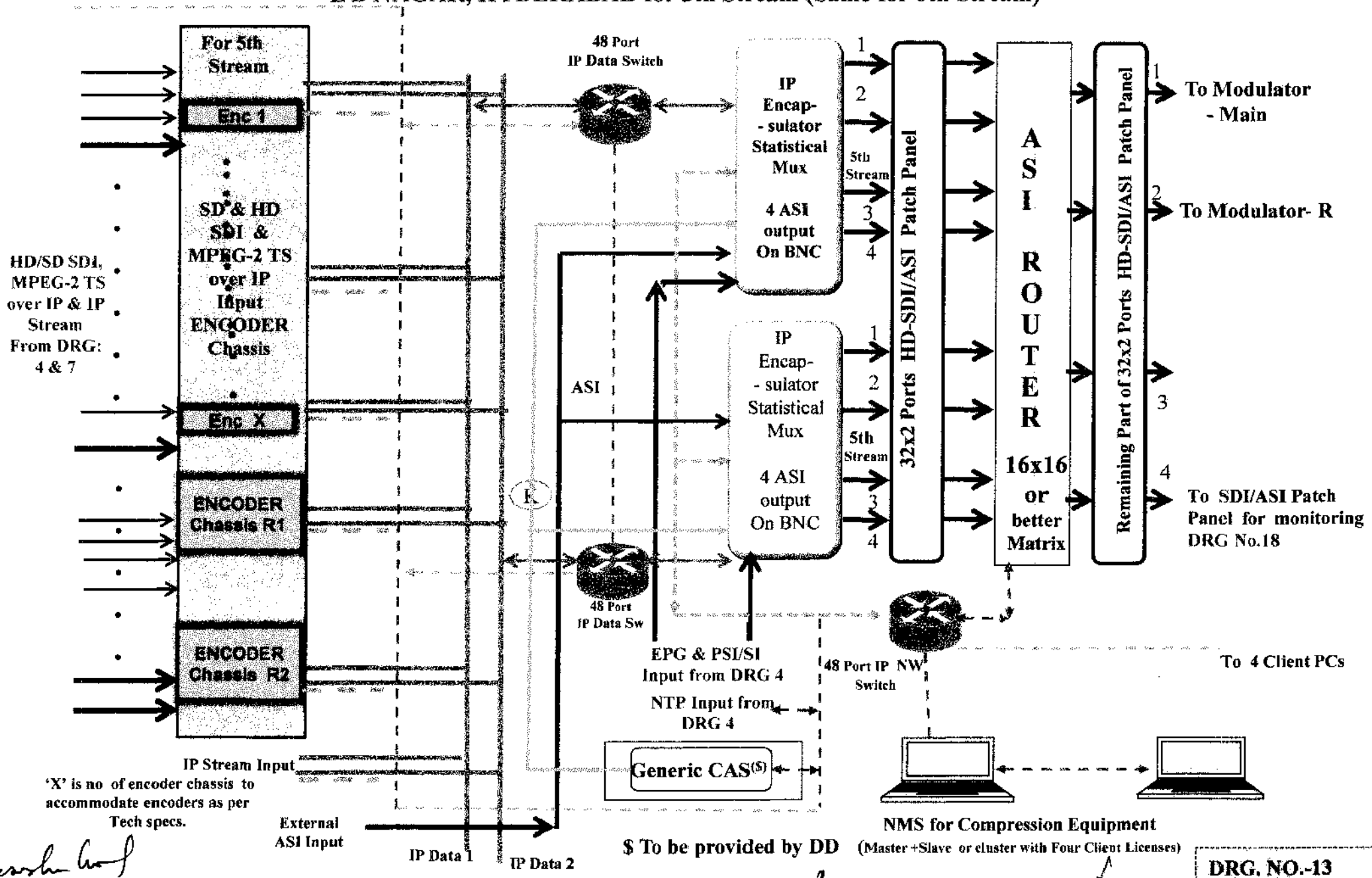
DRG. NO.-11

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD for 3rd Stream (Same for 4th Stream)



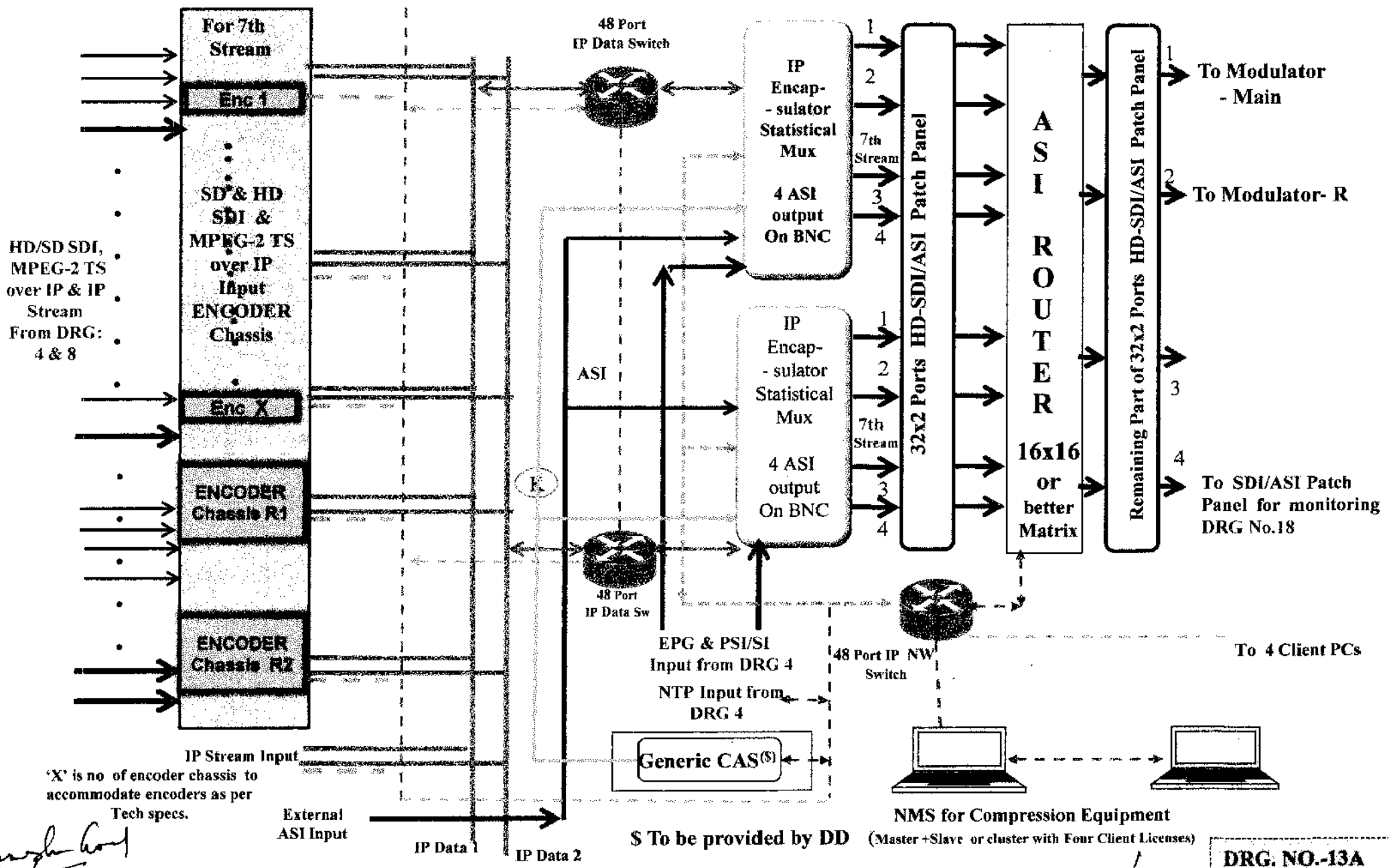
DRG. NO.-12

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD for 5th Stream (Same for 6th Stream)



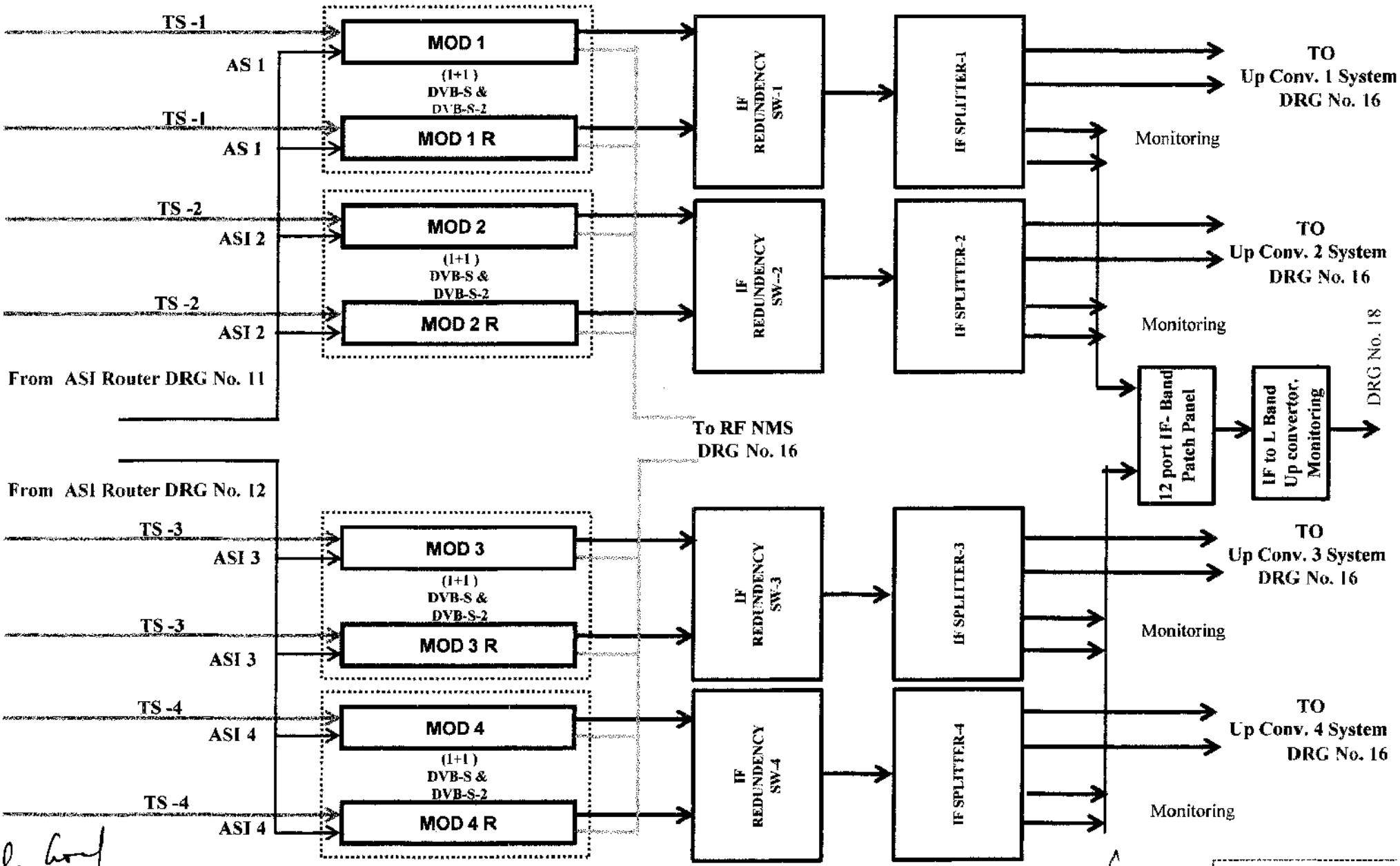
DRG. NO.-13

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD for 7th Stream (Same for 8th Stream)



DRG. NO.-13A

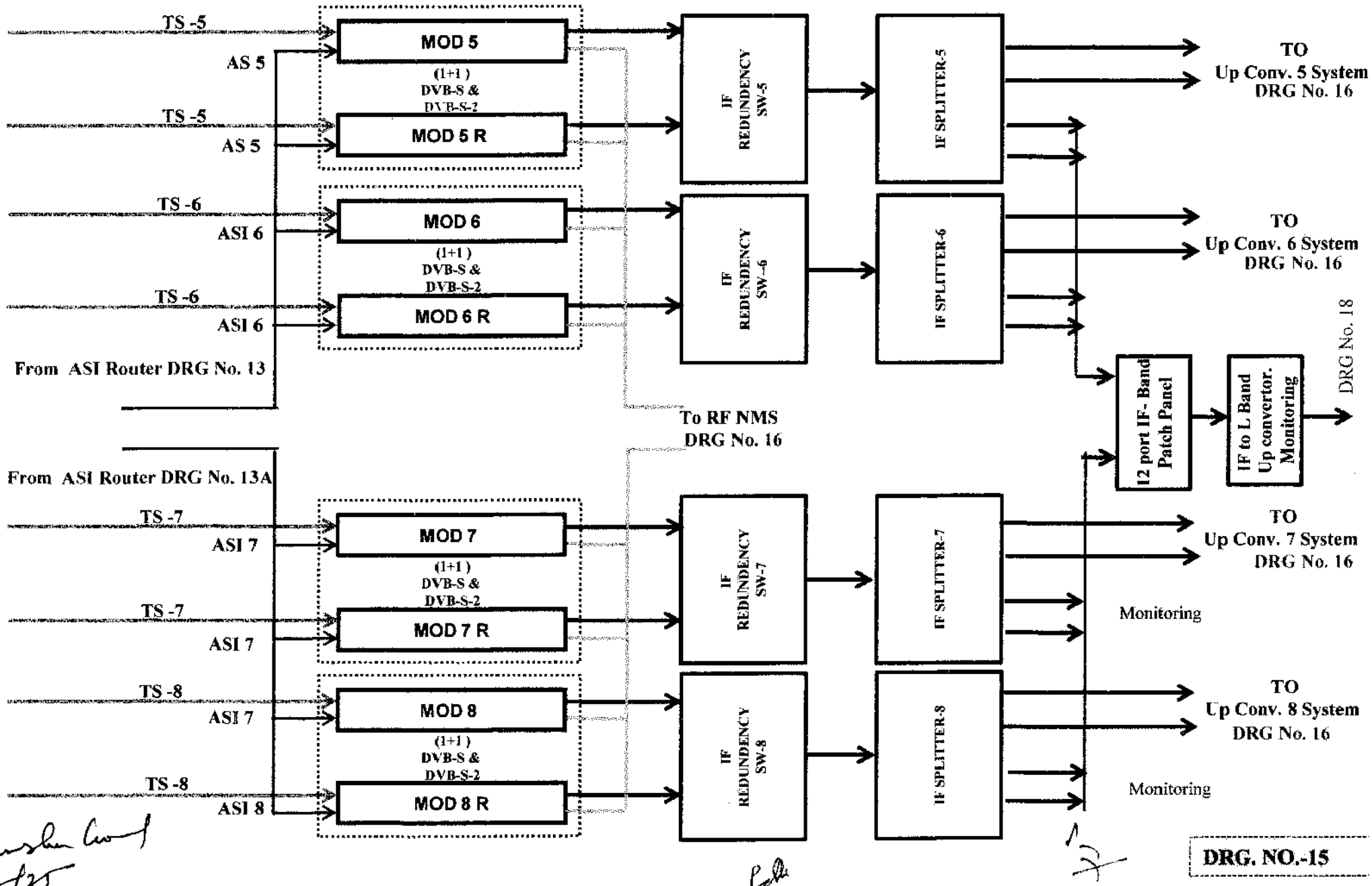
Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - (1+1) Satellite Modulator for 1st, 2nd ,3rd & 4th Stream.



15/05/25

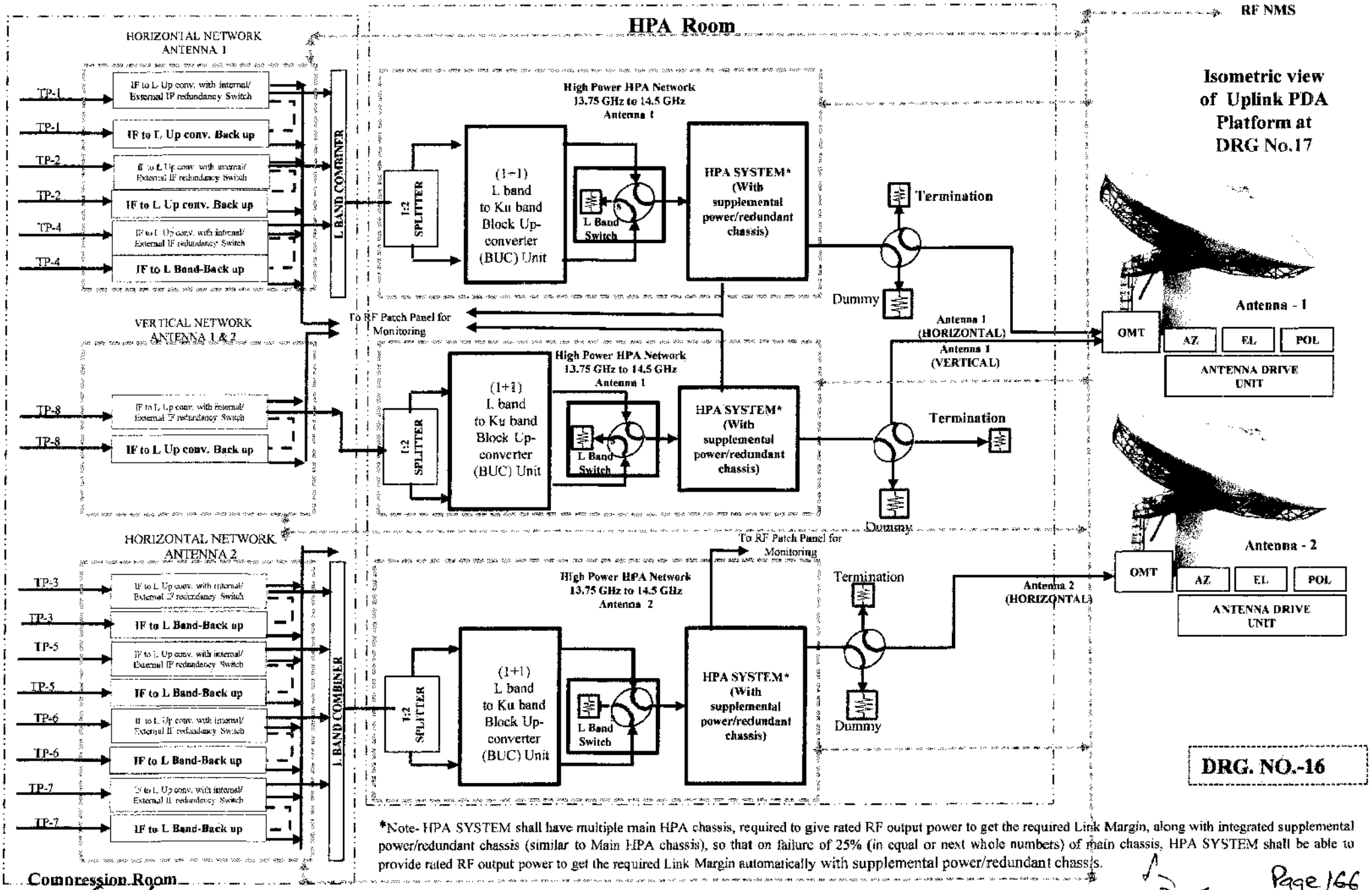
DRG. NO.-14

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD - (1+1) Satellite Modulator for 5th , 6th , 7th & 8th Stream.



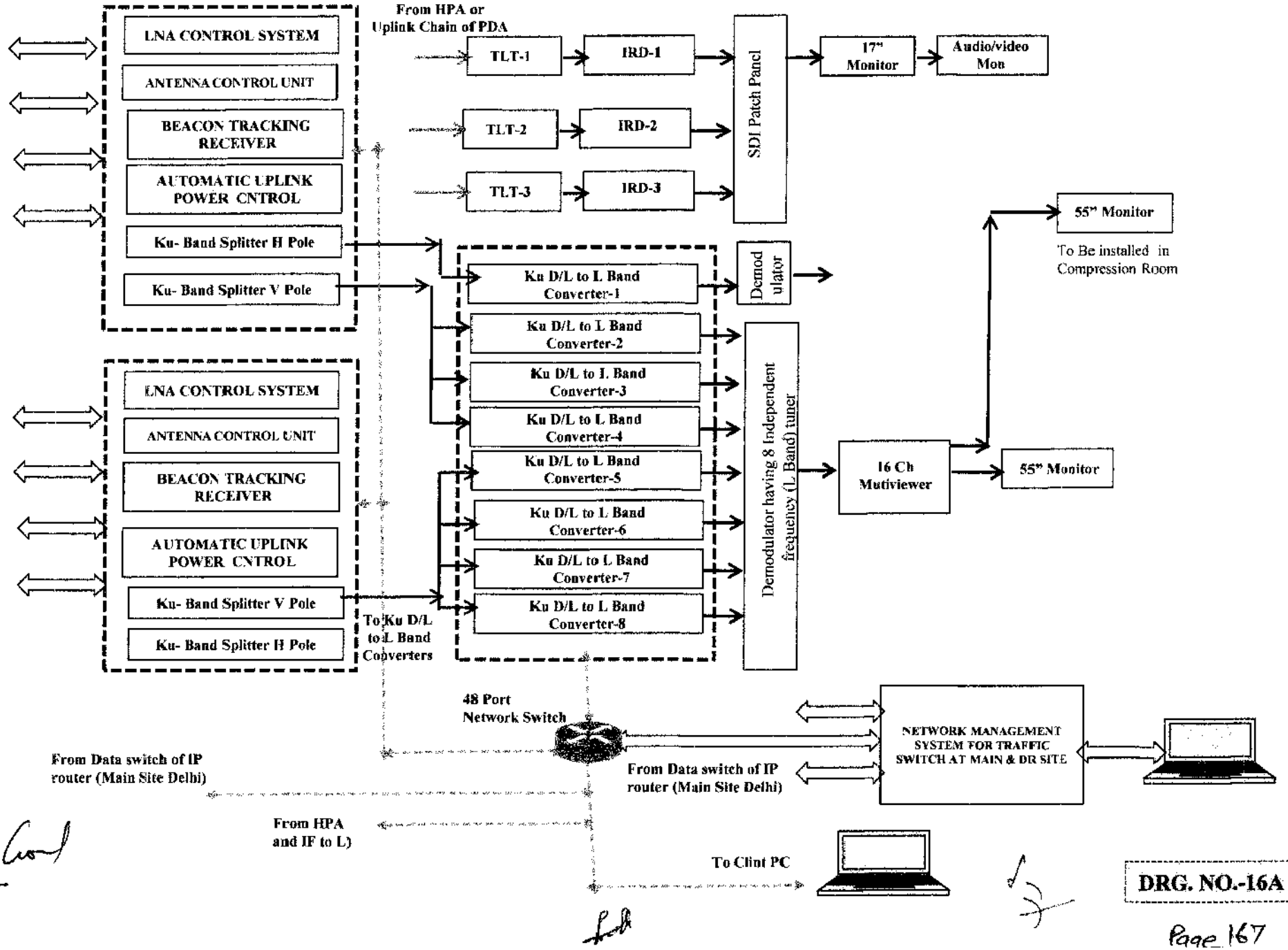
DRG. NO.-15

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD
(Upconverter, RF and Uplink Antenna System)



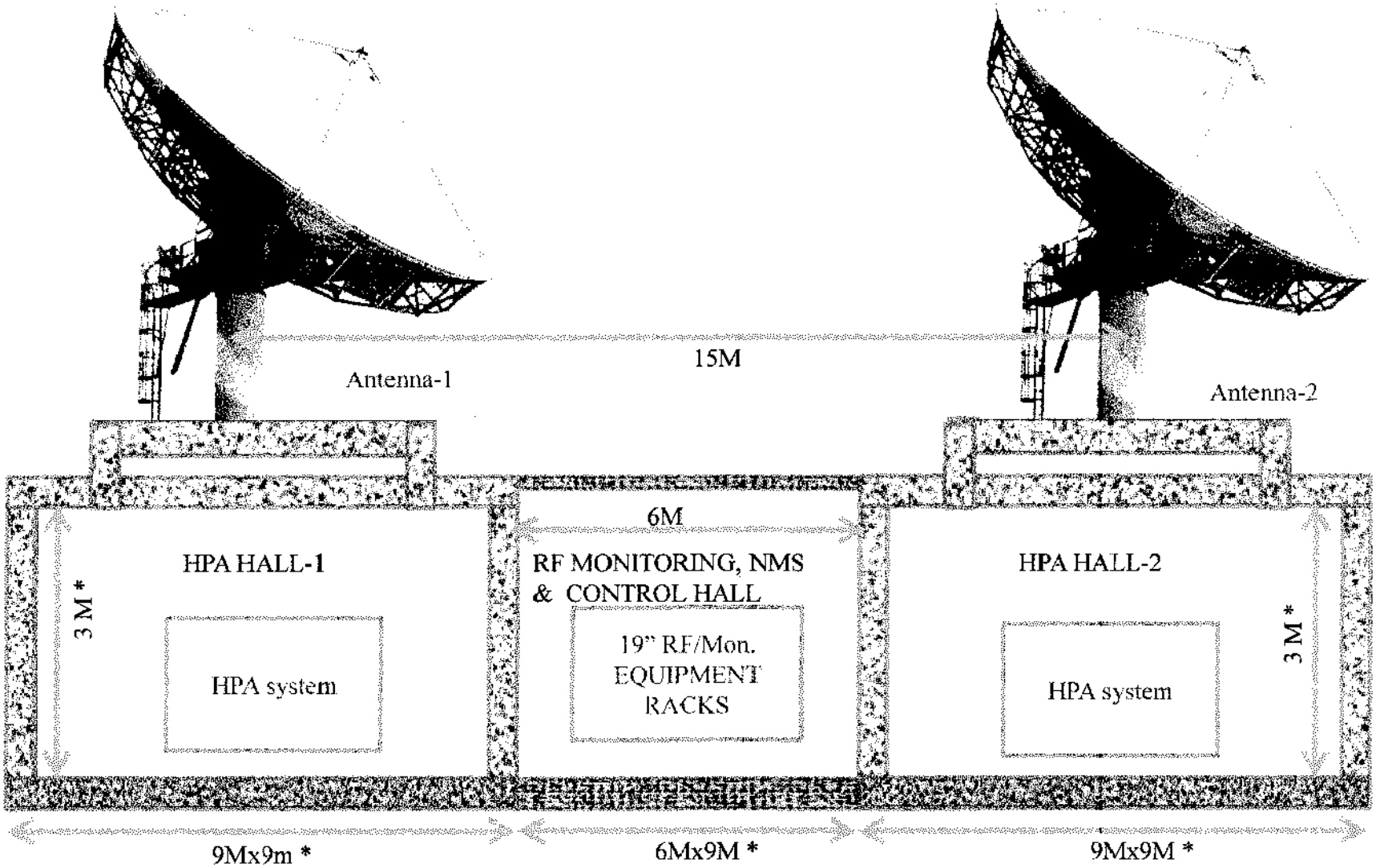
*Note- HPA SYSTEM shall have multiple main HPA chassis, required to give rated RF output power to get the required Link Margin, along with integrated supplemental power/redundant chassis (similar to Main HPA chassis), so that on failure of 25% (in equal or next whole numbers) of main chassis, HPA SYSTEM shall be able to provide rated RF output power to get the required Link Margin automatically with supplemental power/redundant chassis.

Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish Platform at L B NAGAR, HYDERABAD
(RF Switching, NMS and Monitoring System)



DRG. NO.-16A

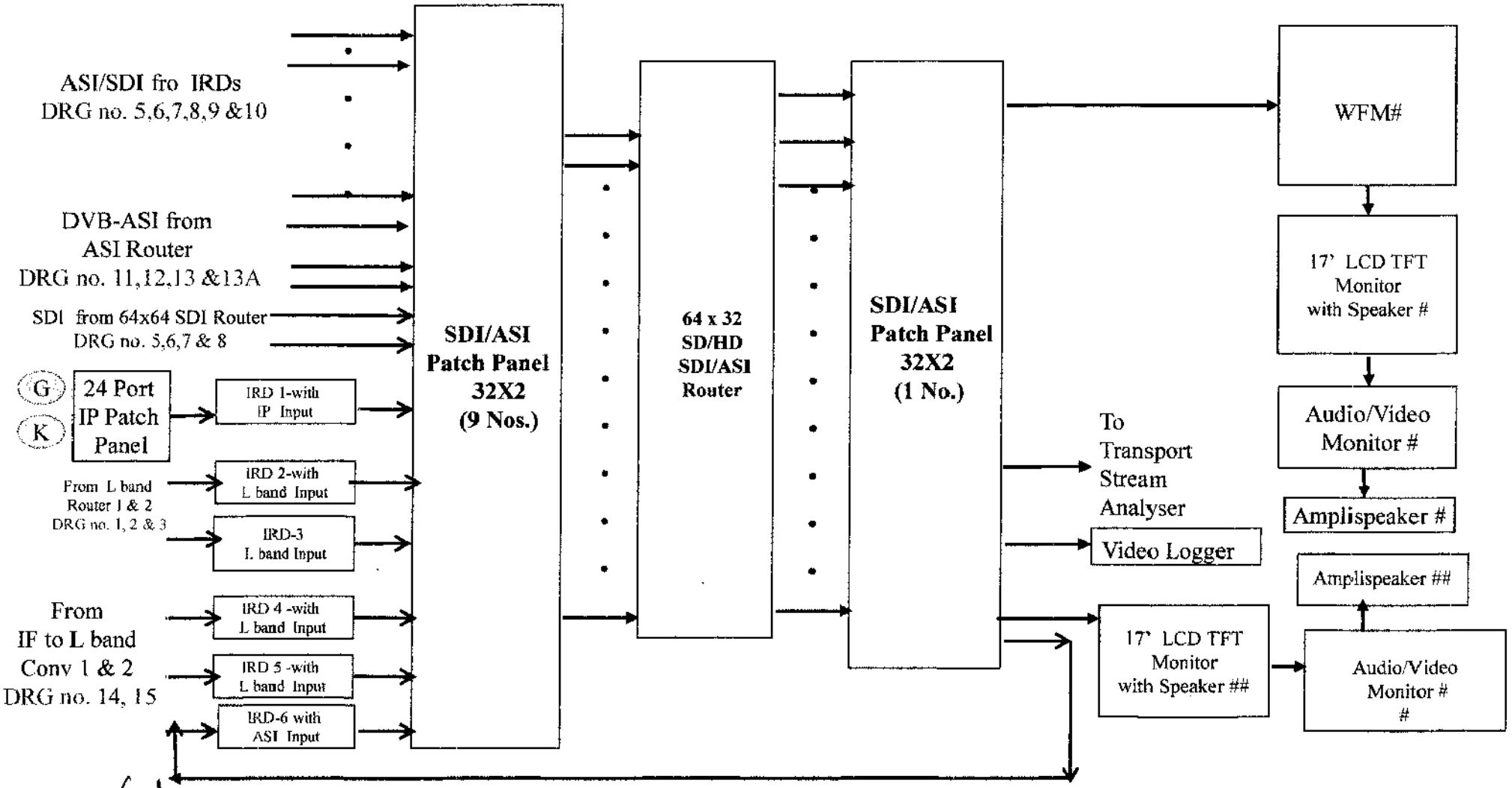
Suggestive Block Schematic for SITC of Disaster Recovery Center for DD FreeDish
Isometric view of PDA Platform at L B NAGAR, HYDERABAD (Uplink Antenna System)



(*Picture of PDAs are for illustration purposes only and dimensions of PDA foundation may vary as per solution offered)

DRG. NO.-17

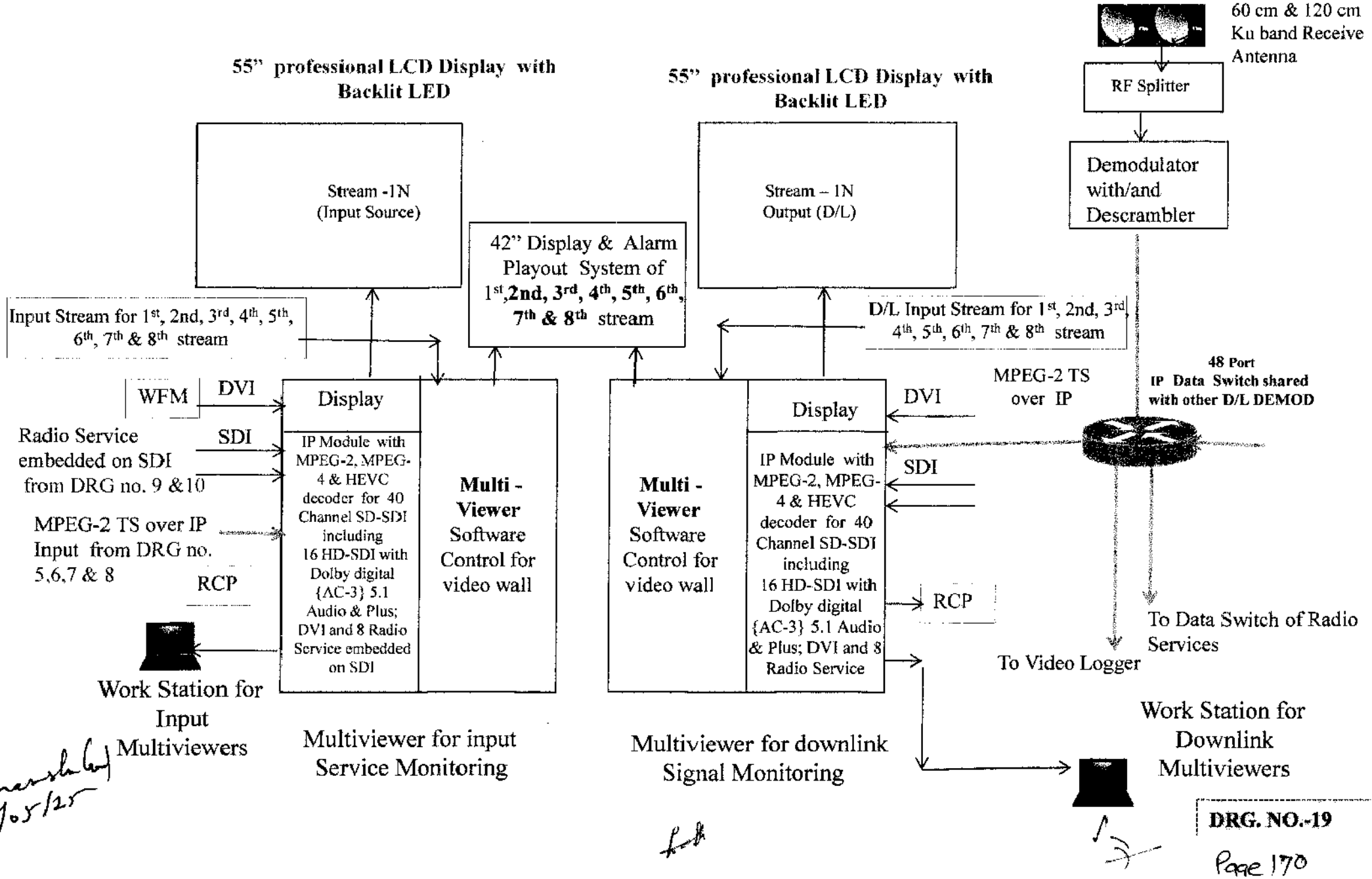
Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD - Confidence Level Monitoring Setup



#To be mounted in Monitoring Room
To be mounted in Compression Room

DRG. NO.-18

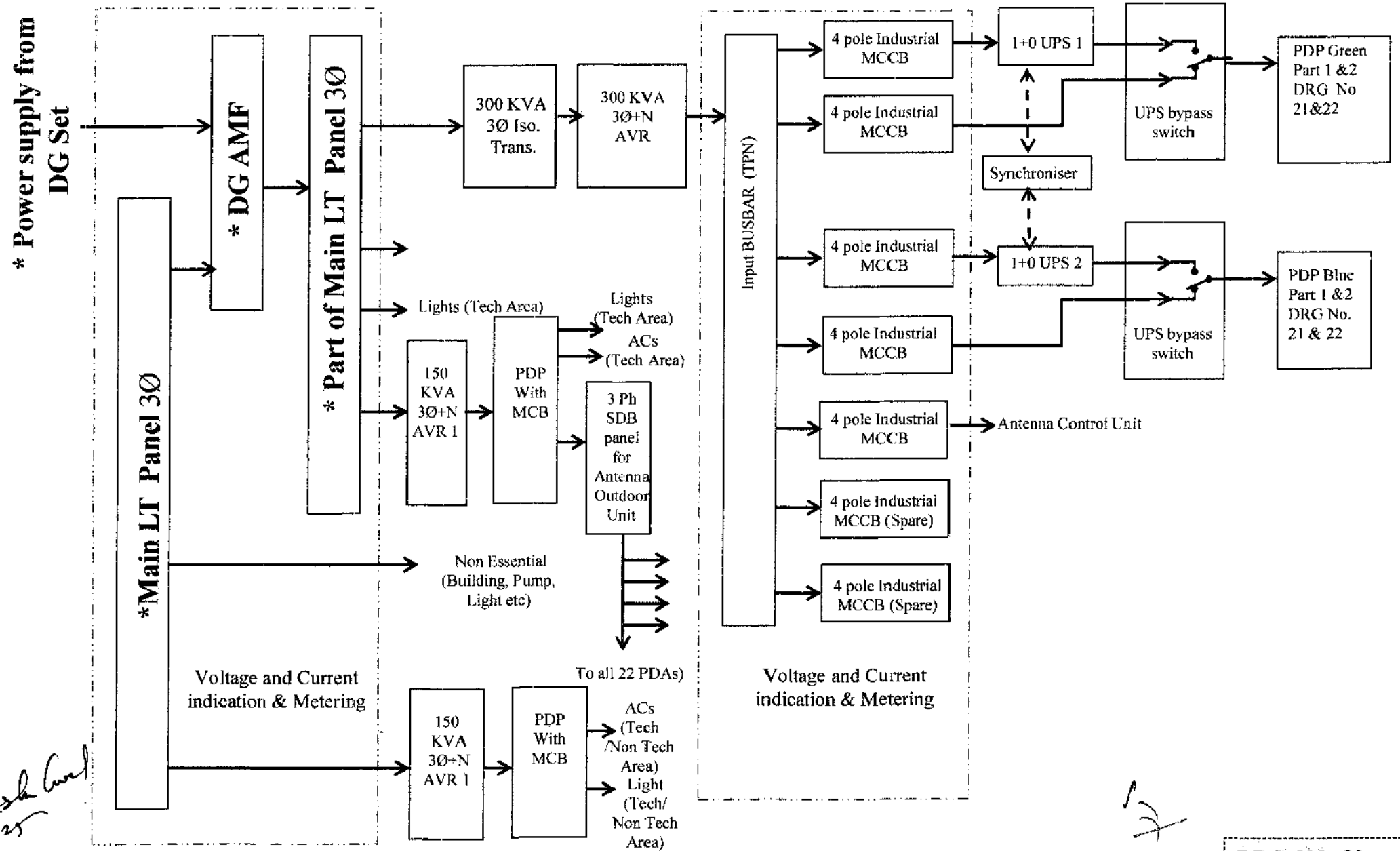
Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD for 1st Stream (Same for 2nd, 3rd, 4th, 5th, 6th, 7th & 8th stream)



DRG. NO.-19

Page 170

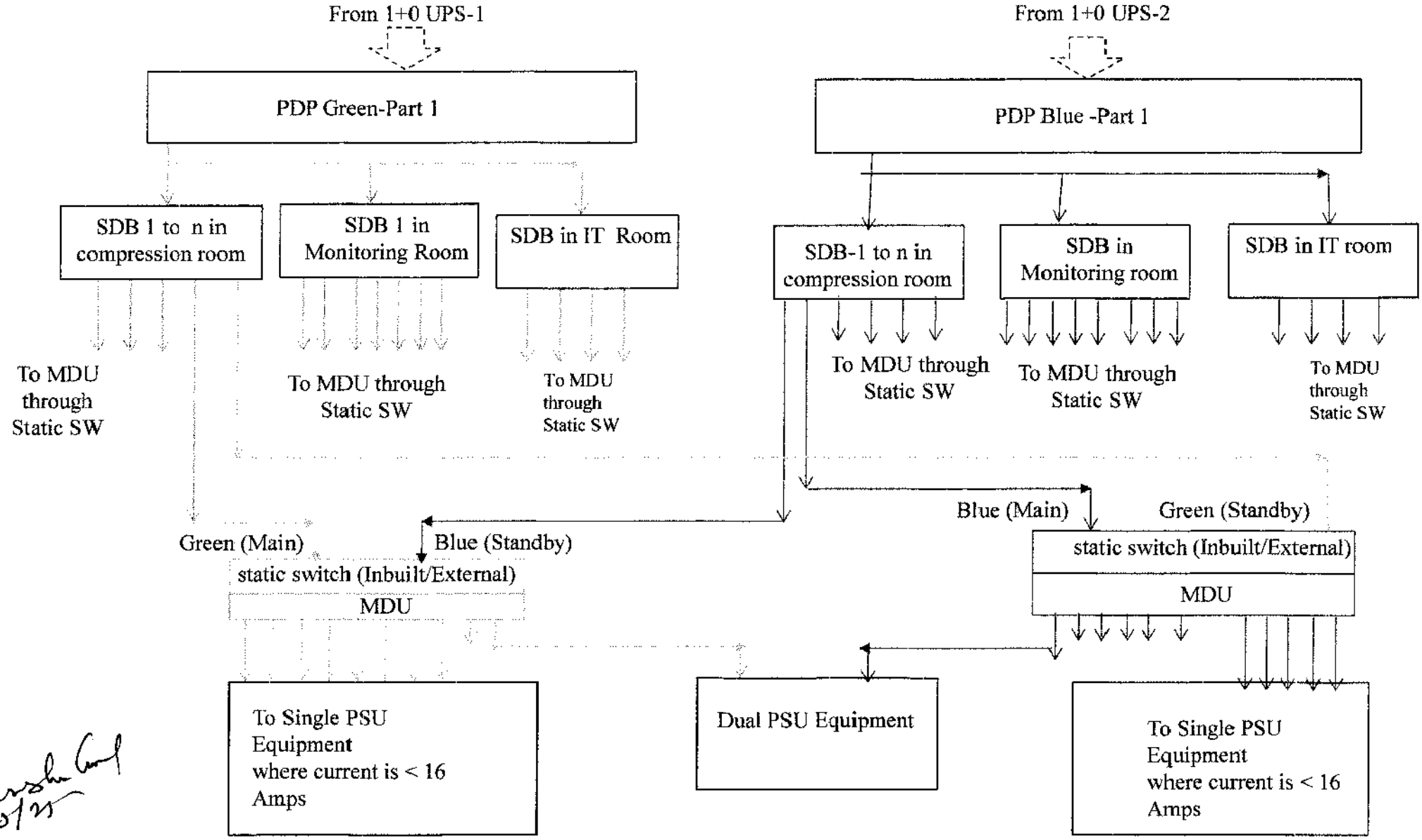
Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD - Power Supply Arrangement (Power Distribution Panel & Essential/Non Essential Power Supply System)



* DG Set , DG AMF and Main LT Panel will be provided by Doordarshan

DRG. NO.-20

Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD - Power Supply Arrangement for Compression Room, Monitoring Room and IT Room.

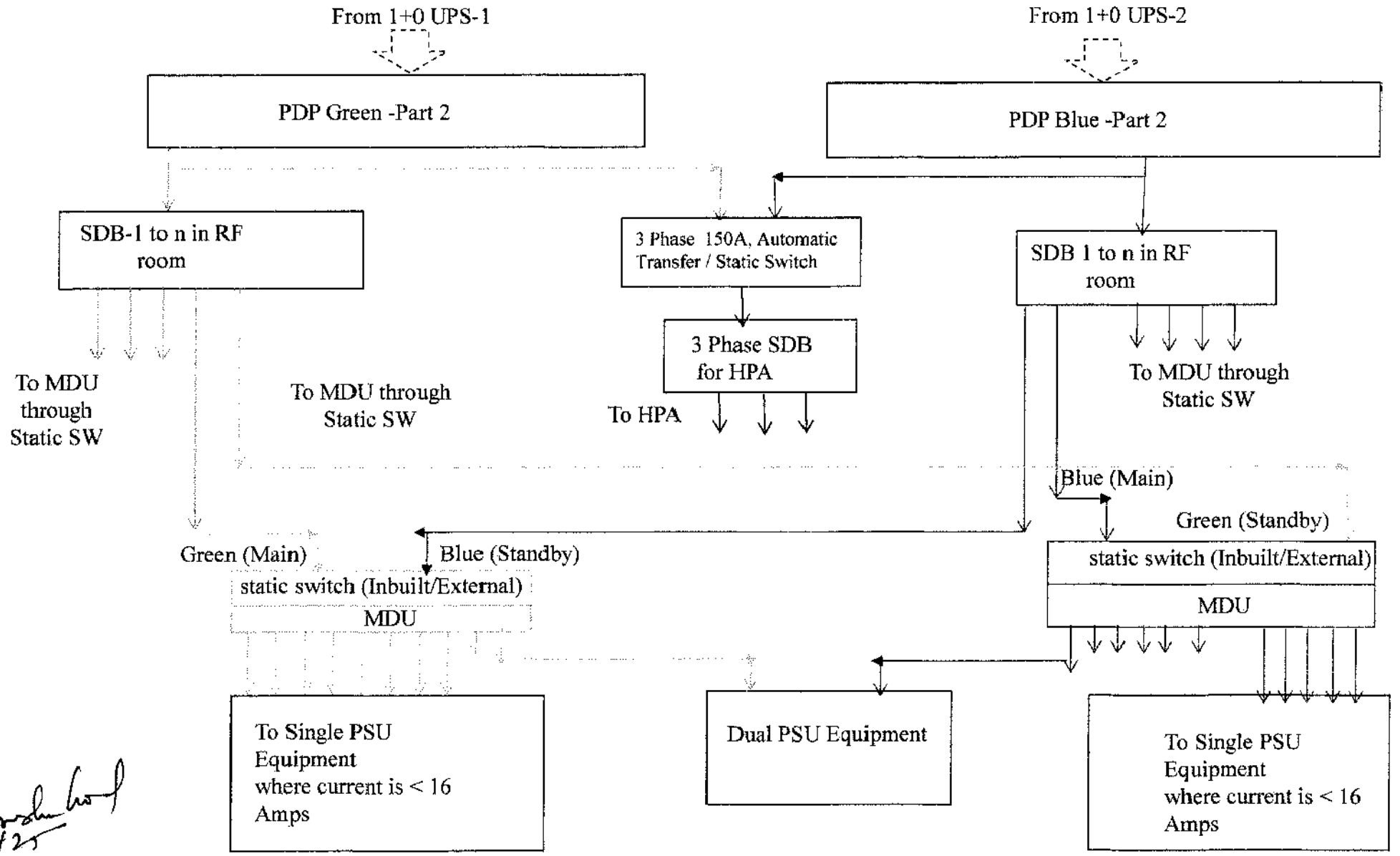


Similarly other MDUs shall be connected to all Equipment rack

Note: Each rack should have both Green and Blue Supply.
N = no. of SDBs required to feed Power Supply to each rack.

DRG. NO.-21

Suggestive Block Schematic for Disaster recovery center for DD FreDish platform at LB NAGAR, HYDERABAD - Power Supply Arrangement for RF Room (HPA and RF Mon. eqpt.)



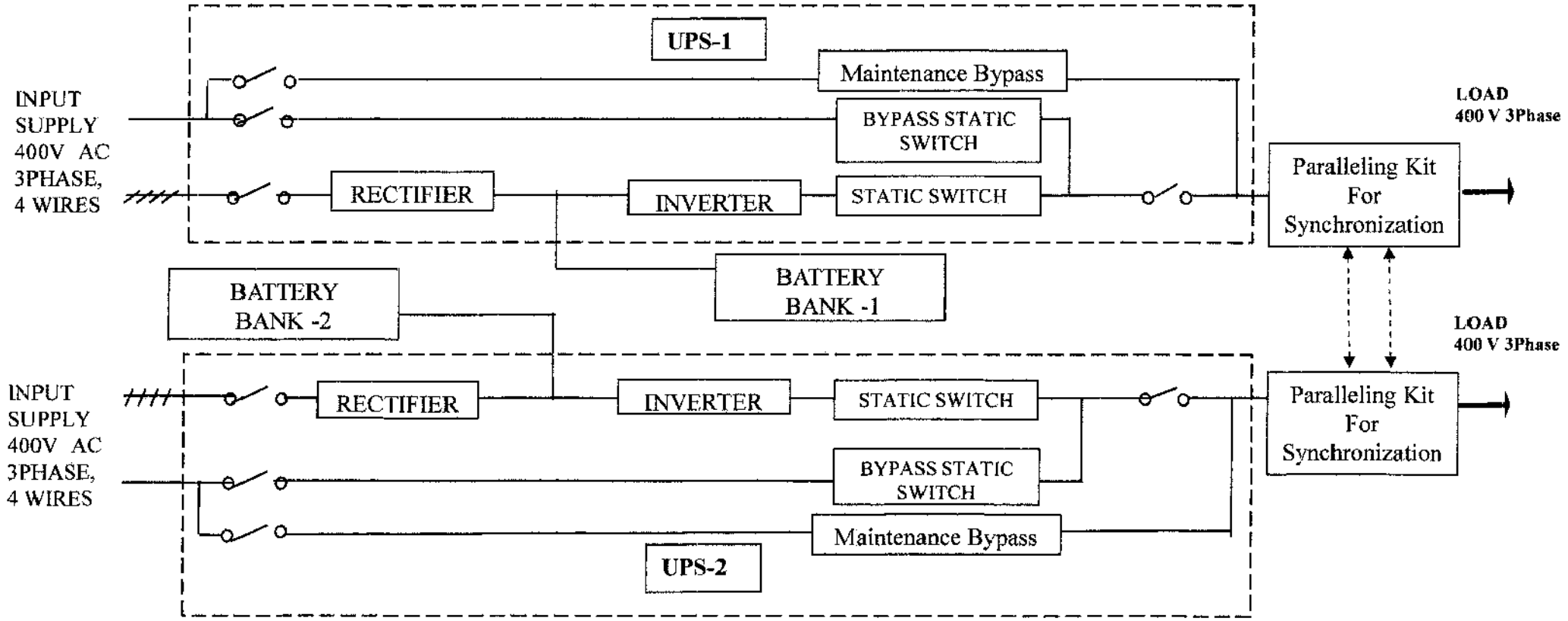
Similarly other MDUs shall be connected to all Equipment rack

Note: Each rack should have both Green and Blue Supply.
N = no. of SDBs required to feed Power Supply to each rack.

DRG. NO.-22

Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD

200 KVA (3 phase) Uninterrupted Power Supply(UPS) in 2x(1+0) parallel load sharing mode

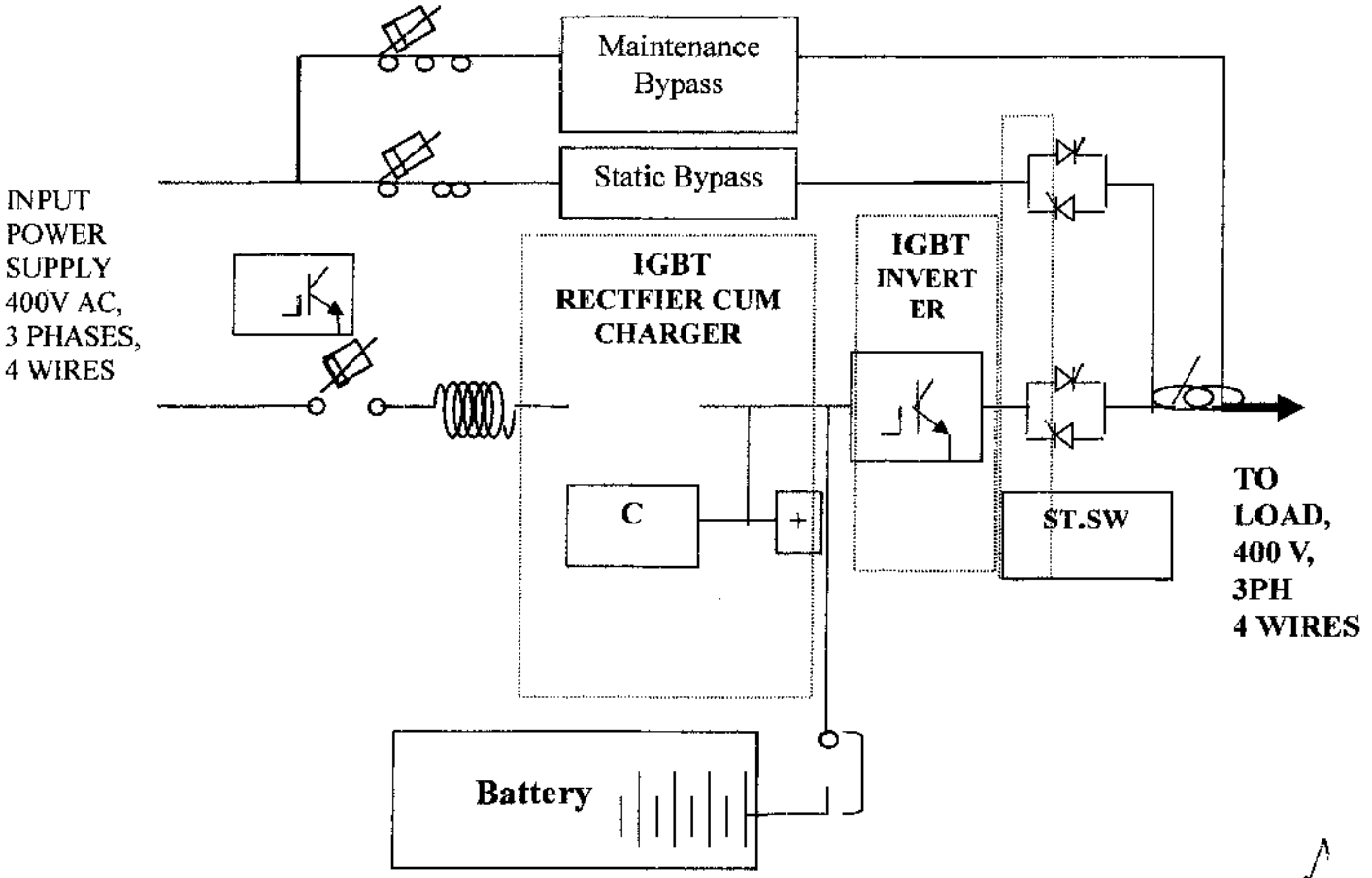


DRG. NO.-23

Page 174

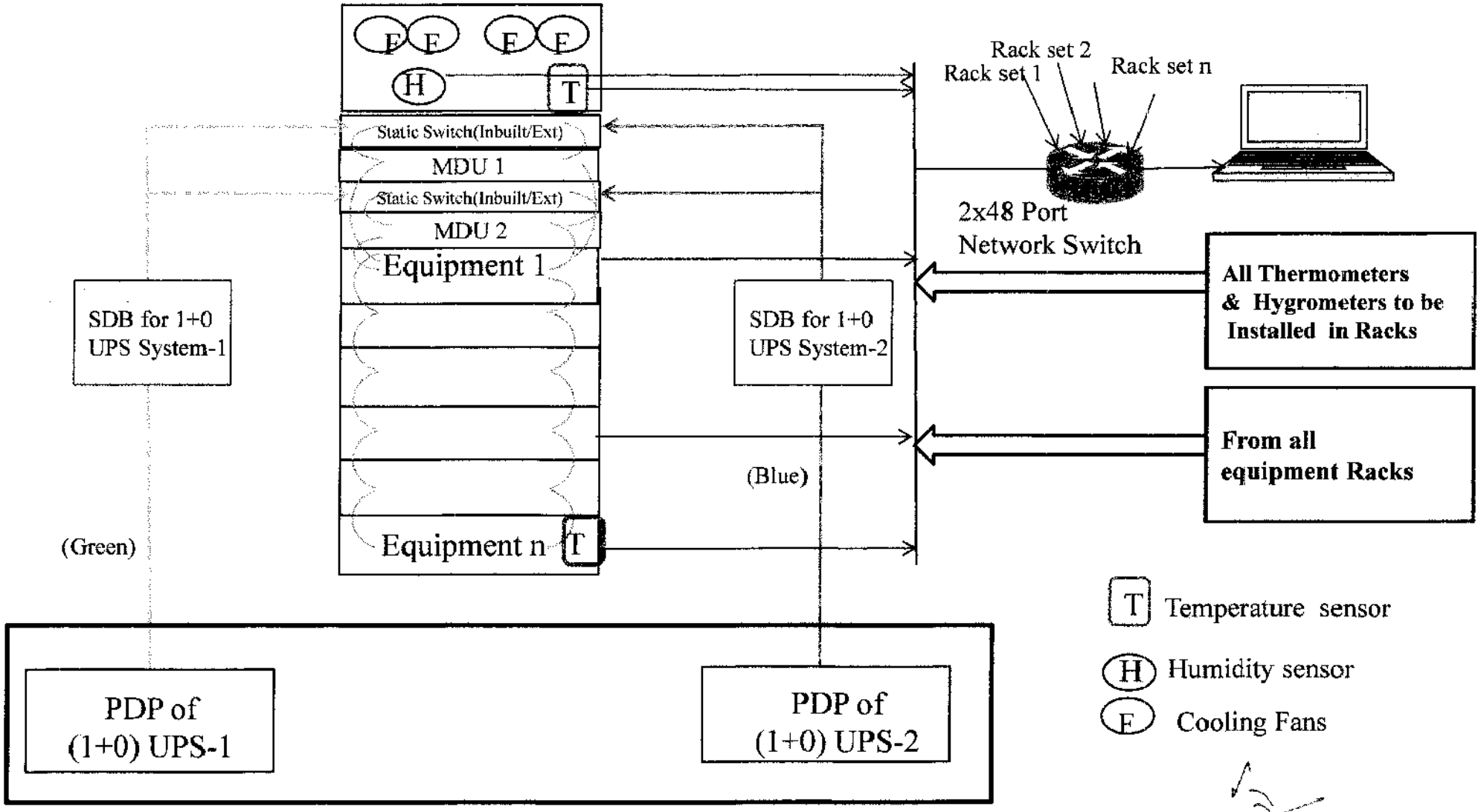
Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD

200 KVA (3 phase) Uninterrupted Power Supply(UPS) in 2x(1+0) SINGLE MODULE



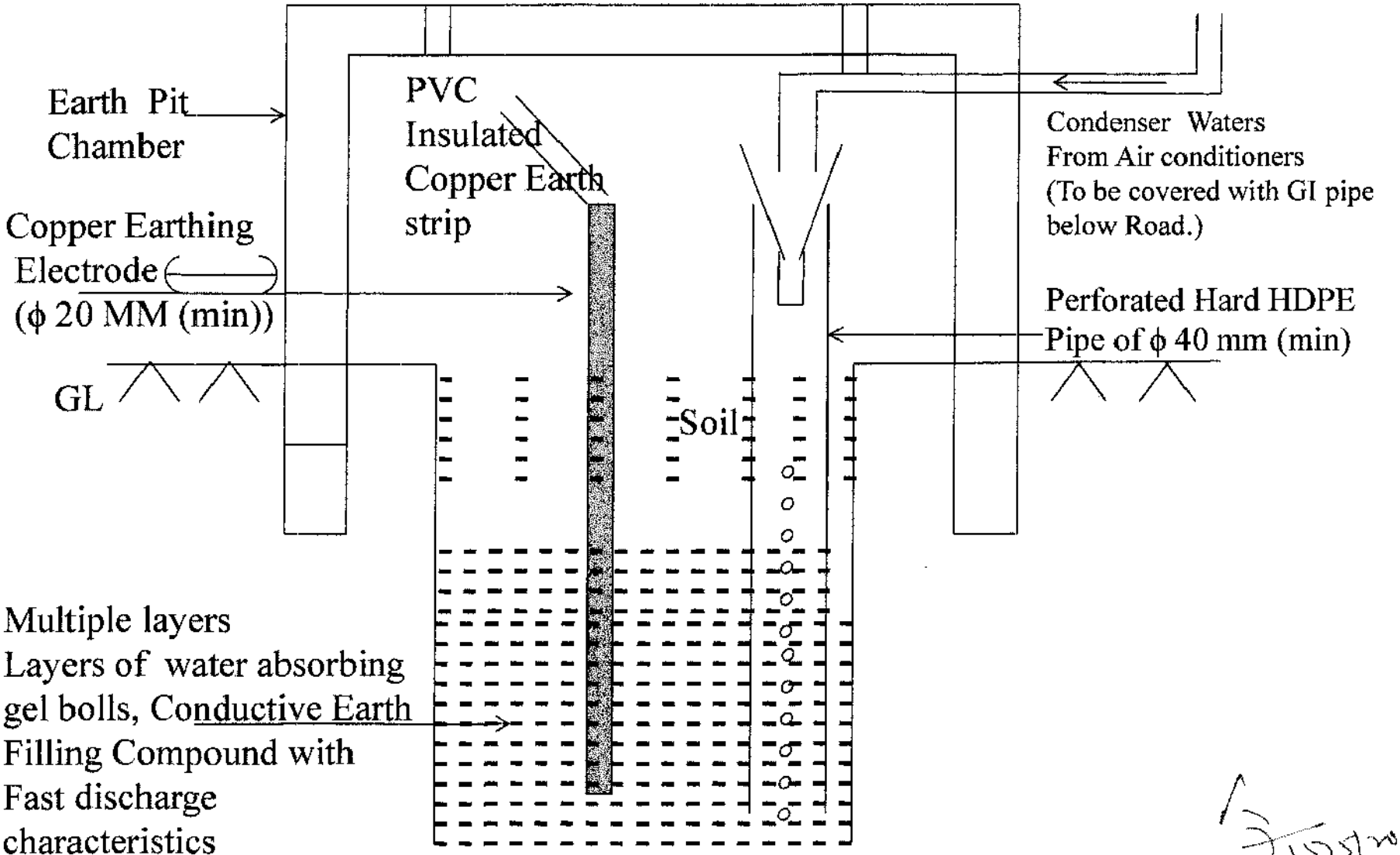
DRG. NO.-24

Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD - Power Distribution, Temp & Humidity Monitoring in Racks



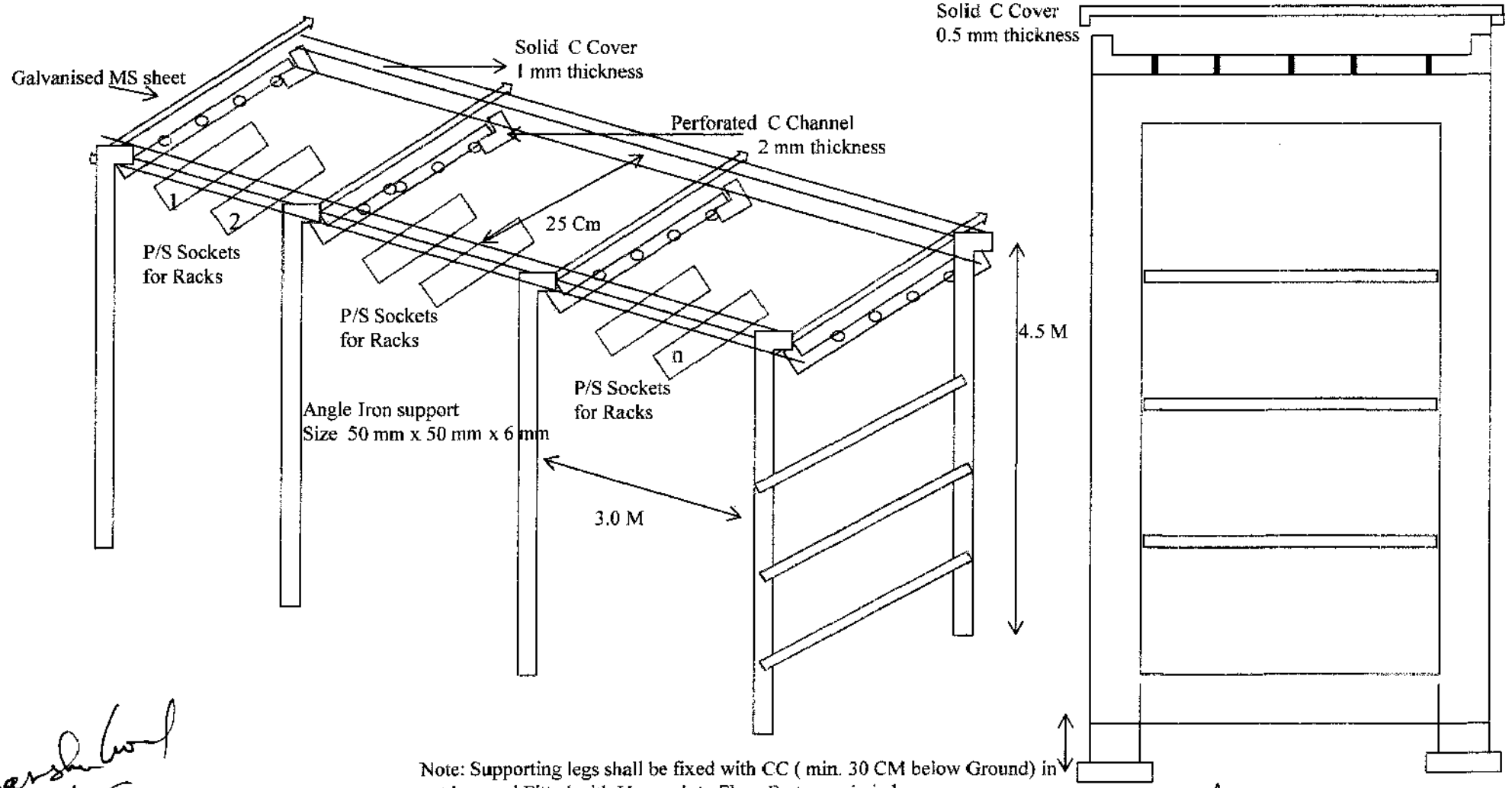
DRG. NO.-25

Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD - Earth Pit



DRG. NO.-26

Suggestive Block Schematic for Disaster recovery center for DD FreeDish platform at LB NAGAR, HYDERABAD - Cable Support System



Note: Supporting legs shall be fixed with CC (min. 30 CM below Ground) in outdoor and Fitted with Heavy duty Floor Fasteners in indoor.

DRG. NO.-27

Annexure-I

Suggestive Bill of Material (BOM) for Disaster Recovery Center for DD Freedish Platform at LB Nagar, HYDERABAD.

Sl. No.	Description of Item as per Specification (Suggestive BOM)	Quantity as per suggestive BOM		Budgetory Cost in Rupees	
		Total Qty	Unit	Unit Rate	Total Cost
A	**INPUT AND BASE BAND SYSTEM**				
1	**RF signal in L band frequency Optic Fiber Transmitter-Receiver System consisting of:**				
a	**Optic Transmitter** -Outdoor fiber optic transmitter for RF signal in the satellite L–Band frequency range, IP65 weatherproof, packaged in a compact, standalone enclosure. Suitable for mounting/ house in Outdoor Unit mounted on or near the satellite dish antenna structure. (Each Set consist of Min.5 modules of single channel Optical Transmitter i.e. (4 Modules mains + 1 Modules as a Cold standby) per Set.	5	Set		
b	**Outdoor Unit-** Compact IP65 weather proof enclosure/Outdoor Unit which can house up to 6 No. active Optic fiber transmitter modules, alongwith required accessories with mounting brackets to be conveniently mounted directly on or near the antenna structure.	5	Sets		
c	**Power supply unit** - Each set feed min. six RF fiber optic transmitters located in outdoor (100m min. from the power supply Unit) including DC power for upstream LNBs, consisting dual, isolated, redundant DC power supplies and provides min. eight outputs on F-Type connectors. This power supply Units should be housed in Compact enclosure and will be kept in compression Room.	5	Sets		
d	Min. 1 Sqmm, Min. 12 core (multiple colour) Shielded Armoured outdoor type DC power Cable (min 100 Meter) as per site requirement, with suitable connectors at both ends on each core, for feeding DC power supply from indoor Power supply Unit to Outdoor fiber optic transmitter installed near Rx antenna.	5	Sets		
e	**Optic Receiver** -Single mode, single channel Optical Receiver to L band module for 10 Independent signal per set. Each Set consist of Min.12 modules of single channel Optical Receiver i.e. (10 Modules mains + 2 Modules as a Cold standby) per Set.	2	Set		
f	Frame contoller card for Remote Configuration and Monitoring of signal	2	Set		
g	19" Rack Frame/ Chassis with hot swappable dual Redundant power supply unit and Rack mounting Kit for mounting of L band Optical Fiber Receiver Module alongwith required accessories.	2	Set		
h	Each set of Fiber Management system consist of- i- Min 12 Port Fiber Management system for Optic Receiver (19" rack mounted) with optical wiring for connecting the optical Receivers and standard accessories - 1 No. ii- optical Patch Cards- 6 Nos ,	5	Set		
i	Min 12 Port, F type Female L band Patch panels with 19 " Rack mounting kit. L Band Patch Panel will be mounted at the input side of (64x320) L band Roter	6	Set		
j	Min 12 Port, F type Female L band Patch panels with 19 " Rack mounting kit. (42 Set will be mountes as :- 2 Nos L Band Patch Panels will be mounted in each IRD Rack (Expecting 16 TV IRDs in one rack and 16 Nos of such Racks for TV IRDs) so total 2x16=32+ Expecting 18 Radio IRDs in one rack and 4 Nos of such Racks for Radio IRDs) so total 2x4 Patch Panels for IRDs 2 Nos L Band Patch Panel will be mounted in Monitoring Racks. Therefore 32+8+2=42 Patch Panel Sets)	42	Set		

17/05/25

15/5/2025

k	Provision of 12 Core , single mode, Outdoor type, optical Fibre cable as per site requirement with termination box/FMS at Rx end and OFC Patch cord with SC/APC or LC/APC connector at both end, in each core between Outdoor Unit housing Optical Transmitter to Indoor Unit (Min. 100 m) (One Set consit two OFC and laid as 1 OFC Cable set to be connected in circuit and 1 OFC Cable set kept as cold standby) as per DRG No 02 & 03	5	Set		
l	Low loss L band cable and matching connector with Gold plated Pin as per site requirement (12 meters per signal i.e. ~~2x10x12 =240 mtrs (min.)~~ to be connected from LNB to Optical Transmitter per DRG No. 02 & 03.	1	Lot		
m	Low loss L band cable and matching connector with Gold plated Pin as per site requirement (10 meters per signal i.e. 2x10x10 =200 mtrs (min.) to be connected from Optical Receiver to L band Patch Panel per DRG No. 02 & 03.	1	Lot		
n	Low loss L band cable and matching connector with Gold plated Pin as per site requirement (50 meters per signal i.e. 2x10x50 =1000 mtrs (min.) to be connected from L N B to to L band Patch Panel (i.e. input side of L Band Router) as per DRG No. 01 & 03.	1	Lot		
o	Low loss L band cable and matching connector with Gold plated Pin as per site requirement 64x5 =320 mtrs (min.) to be connected from L band Patch Panel to L Band Router Input as per DRG No. 01 , 02 & 03.	1	Lot		
2	**L band Router (64x320) with dual redundant power supply consisting of :**				
a	Fully wired base unit with 64x320 populated L band router including Crosspoint Matrix module/Mid Matrix cards/Central Switch Board; Hot swappable input cards; Hot swappable output cards; hot Swappable frame controller /Hot swappable CPU card; Hot swappable dual redundant power supply unit etc.	1	Set		
b	Additional Cross Point Matrix module/Mid Matrix Card/Central Switch Board	1	No.		
c	Additional hot swappable Frame Controller Card/CPU Card	1	No.		
d	X-Y/Router control panel with cable	1	Set		
e	Necessary power supply to LNBCs	1	Set		
f	Work station with monitor, with cables and accessories for remote configuration, Monitoring and Control of L band Router	1	Set		
g	Low loss L band cable and matching connector with Gold plated Pin as per site requirement 320x15 =4800 mtrs (min.) to be connected from L Band Router Output to L band Patch Panel (mounted in IRD and Monitoring Racks) and At 1:12 Splitter for Radio IRDs, as per DRG No. 01, 02, 03, 09 and 10	1	Set		

3	**Professional IRDs consisting of:**				
a	Professional IRDs (for TV) with L-band inputs of DVB-S & DVB-S2, DVB-ASI & IP Input compliance decoder (MPEG 2 TS over IP) and DVB-ASI, HD-SDI, SD-SDI, AES/EBU, HD-SDI embedded audio, SD-SDI embedded audio, One downconverted SD-SDI of HD-SDI, Dolby digital (AC-3) 5.1 audio and Dolby Digital Plus 5.1 Audio (E-AC-3) output, MPEG-2 TS over IP output with Multi service filtering facility and having 4:2:0 & 4:2:2 compliant for MPEG-2, H.264/MPEG-4-AVC and 4:2:0 compliant for H.265/HEVC decoding and Common Interface slot hardware, BISS mode-1 & BISS-E Compliant) and dual redundunt Power supply unit. (28 Professional IRDs per Lot). Note: No. of Chassis for Professional IRDs shall be dependent on the offered solution.	8	Lots		
b	If one Professional IRD (For TV) per chassis is offerd, then four Redundant Chassis with Professional IRD per lot similar to main chassis without any limitation by way of hardware & software upgradation. OR If more than one Professional IRDs (For TV) per chassis is offerd, then two Redundant Chassis with Professional IRDs per lot similar to main chassis without any limitation by way of hardware & software upgradation.	8	Lots		
c	Professional IRDs (for Radio) with L-band inputs of DVB-S & DVB-S2, DVB-ASI & IP Input compliance decoder (MPEG 2 TS over IP) and DVB-ASI, HD-SDI, SD-SDI, AES/EBU, HD-SDI embedded audio, SD-SDI embedded audio, One downconverted SD-SDI of HD-SDI, Dolby digital (AC-3) 5.1 audio and Dolby Digital Plus 5.1 Audio (E-AC-3) output, MPEG-2 TS over IP output with Multi service filtering facility and having 4:2:0 & 4:2:2 compliant for MPEG-2, H.264/MPEG-4-AVC and 4:2:0 compliant for H.265/HEVC decoding and Common Interface slot hardware, BISS mode-1 & BISS-E Compliant) and dual redundunt Power supply unit . (8 Professional IRDs per Lot). Note: No. of Chassis for Professional IRDs shall be dependent on the offered solution.	8	Lots		
d	If one Professional IRD (For Radio) per chassis is offerd, then two Redundant Chassis with professional IRD per lot, similar to main chassis without any limitation by way of hardware & software upgradation. Or If more than one Professional IRDs (For Radio) per chassis is offerd, then one Redundant chassis with professional IRDs per lot, similar to main chassis without any limitation by way of hardware & software upgradation.	8	Lot		
e	Low loss RF cable (for TV) and matching F/BNC type connector with Gold plated pin as per site requirement (3 meters per signal i.e. 32x2x8x3=1536 mtrs (min.) from L band Patch Panels to IRDs (TV) as per DRG No. 5, 6, 7 & 8.	1	Lots		
f	Low loss RF cable (For Radio) and matching F/BNC type connector with Gold plated pin as per site requirement (5 meters per signal i.e. 2x8x5=80 mtrs (min.) from L band Patch Panels to Splitter and 2x10x8x3=480 mtrs (min.) from Splitter to IRDs (Radio) as per DRG No. 5, 6, 7 & 8.	1	Lots		
g	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 5, 6, 7 and 8 between the HD SDI output port of all IRDs (For TV) to HD-SDI Patch Panel etc.	1	Lot		

h	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 5, 6, 7 and 8) between the ASI output port of all IRDs (For TV) to HD-SDI Patch Panel for Monitoring	1	Lot		
i	Audio/Video cable with matching connector for AES/EBU Digital Audio from IRD output to AES Audio Embeders through AES Patch Panel as per site requirement	1	Lot		
j	HD SDI cable from the output of all Audio Embedder to HD-SDI Patch Panel , HD/SD SDI Router for Radio Chain etc.	1	Lot		
k	1:12 L Band Splitter as per DRG No 9 and 10.	16	Sets		
4	**IP Data Switches and Network Switches consisting of:**				
a	(1+1) IP Data Switch 48 port with inbuilt dual power supply unit and rack mounting kit (For TV Channel).(2 Nos. per set)	8	Sets		
b	(1+1) IP Data Switch 24 port with inbuilt dual power supply unit and rack mounting kit (For Radio Channel).(2 Nos. per set)	4	Sets		
c	IP Network Switch 48 port with inbuilt dual power supply unit with rack mounting kit.	8	Sets		
d	IP Network Switch 24 port with inbuilt dual power supply unit with rack mounting kit.	4	Set		
e	Indoor type CAT-6 Cable with connector as per site requirement and DRG No. 5, 6, 7, and 8. (Min 10 mtr x 3 nos of CAT-6 cable x Number of IRD Chasis for TV Channels) + (Min 3 Nos. spare CAT-6 cable in each rack connected to IP Data switch/IP Network switch)	8	Sets		
f	Indoor type CAT-6 Cable with connector as per site requirement and DRG No. 9 and 10. (Min 10 mtr x 3 nos of CAT-6 cable x Number of IRD Chasis for Radio Channels) + (Min 3 Nos. spare CAT-6 cable in each rack connected to IP Data switch/IP Network switch)	4	Sets		
5	**8 Channel AES/EBU SD-SDI & HD-SDI Emmbedder and associated Accessories for Radio Service consisting of:**				
a	8 Channel AES/EBU Digital audio and SD-SDI & HD-SDI Emmbedder card. (8 Cards are in Ckt and 2 cold standby)	10	Nos.		
b	Audio cable with matching XLR Audio connector for 8 AES/EBU Digital Audio as per site requirement (8 Cards are in Ckt and 2 cold standby)	10	Sets		

Himanshu Goel
15/05/25

15/5

c	19" Rack Frame mounting with Frame controller for remote configuration & monitoring; and auto switchable dual redundant power supply unit. One lot consists of 1 set if Two Audio Embedder Card is mounted in one 19" Rack Frame or One lot consists of 2 sets if One Audio Embedder Card is mounted in one 19" Rack Frame.	5	Lot		
d	2 Nos of 12 (min) port XLR Type 19" rack mounting Audio Patch Panel OR 1 No of 24 (min) Ports BNC Type 19" rack mounting Audio Patch Panel	8	Sets		
6	**Enterprise Grade Next Generation Firewall System consisting of:-**				
a	Enterprise Grade Next Generation Firewall system with minimum 8 x 1 Gigabit Ethernet (RJ 45), dedicated port for HA conectivity & Management and 4x10 GE Small Form-Factor Pluggable (SFP or SFP+) hardware device/module in HA (High Avaialbility) configuration including inbuilt dual power supply unit (2 Nos per set)	1	Set.		
b	Administration & Management System in HA (High Availability) configuration for Firewall including inbuilt dual power supply unit and associated accessories (2 Nos per set).	1	Set.		
c	Indoor type CAT-6 Cable with connector as per site requirement and suggestive Block Diagram No. 4 . (i)- Min 360 meter per set (3x8x15 meter) from 48 port IP Data switch to 48 Port IP Data switch at input for Encoders (ii)- Min 360 meter per set (3x8x15 meter) from 48 port IP Data switch to 48 Port IP Data switch at input for Multiviewers of (in compression Room). (iii)- Min 15 meter per set (3x5 meter) in between IP Router and Firewall (in compression Room)	1	Set.		
7	IP Router with minimum 4 x 1 Gigabit Ethernet (RJ 45) and 4x10 GE Small Form-Factor Pluggable (SFP or SFP+) hardware device/module including inbuilt dual power supply unit in (1+1) configuration (2 Nos per set)	1	Set.		
8	Essential items/works(If any) to complete the installation of Input and Baseband system	1	Set		
9	Installation, testing and system integration of Input and Baseband System	1	Job		
B	**Compression System**				
10	**64 x 64 SD & HD-SDI router wired for all input and out put consisting of:**				
a	Base unit Fully wired for 64x64 Input and Output	8	Sets		
b	Inbuilt hot swappable redundant Cross Point module for 64 x 64	8	Sets		
c	Inbuilt hot swappable redundant controller/ logic modules	8	Sets		
d	Inbuilt hot swappable Redundant Power supply unit	8	Sets		
e	X-Y control panel with cable	8	Nos.		
f	Single Bus remote control panel with cable	8	Nos.		

11	**HD-SDI Patch Panel and Patch cord consist of:**				
a	32 input and corresponding 32 output Ports Type HD-SDI Patch Panels (75 Ohm Impedence) for all Input Ports and all Output Ports of SDI Router as per DRG no. 5, 6, 7, 8. 9 and 10 (1RU, Normal Through, self terminating type) (one lot consist of min 4 Nos of 32 input and corresponding 32 output Ports Type HD-SDI Patch Panels)	8	Lots		
b	HD-SDI Video cables with matching connectors as per site Requirement between the HD SDI Input Patch Panels to Output Patch Panel via 64x64 SDI Router and upto the Input of Encoders. (DRG No. 5,6,7,8,11,12,13, and 13A)	8	Lots		
c	HD-SDI Patch Cord (Impedence -75 Ohm, Cable Length- 3 feet (Minimum) matching with Patch panel	50	Nos.		
d	HD-SDI Patch Cord (Impedence -75 Ohm, Cable Length- 10 feet (Minimum) matching with patch panel	16	Nos.		
12	**Digital Encoder operating on 4:2:0 mode with MPEG-2, H.264/MPEG-4 and H.265/HEVC compression without any limitation by way of hardware & software upgradation (including Stat Mux support) consisting of :-**				
a	Digital encoder with SDI Input signal for 40 SDTV channels in MPEG-2 & H.264/MPEG-4 compression including 16 HDTV channels in H.264/MPEG-4 & H.265/HEVC compression without any limitation by way of hardware & software upgradation. Each encoder chassis shall also be capable to take IP Input (MPEG-2 TS over IP, RTMP, HLS, SRT & ZIXI) and decode 16 Channel & re-encode SD & HDTV channels as per technical specification of tender document without any limitation by way of hardware & software upgradation. Noise reduction hardware/ software for SD &HDTV, Four stereo audio channel including Dolby Digital (AC-3) 5.1 audio (Decoding & Encoding) & Dolby Digital Plus 5.1 audio (decoding & Encoding) with audio level processor & loudness control, logo inserter, Ancillary data facility in all encoders and Dual redundant power supply units with all encoder chassis.	8	Sets		
b	Two Redundant Digital encoder chassis similar to Main Chassis per set without any limitation by way of hardware & software upgradation.	8	Sets		
13	**IP Data and Network Switches Consisting of:**				
a	IP Data Switch 48 port with inbuilt dual power supply unit in (1+1) configuration (2 Nos per set)	8	Sets		
b	IP Network Switch 48 port with inbuilt dual power supply unit with Rack mounting kit.	8	Nos.		
c	Indoor type CAT-6 Network Cable with connector as per site requirement and DRG No. 11, 12, 13 & 13A (min. 5 mtr x 10 nos x 3 nos =150 mtr per set)	8	Sets		

14	**IP Encapsulator with Multiplexer for Statistical Multiplexing in 8x(1+1) configuration consisting of:**				
a	IP Encapsulater with Multiplexer in (1+1) configuration (i.e. 2 Nos per set) for Statical Multiplexing having: i) Minimum Four Independent ASI Input Port with Licenses ii) Minimum Four independent ASI output port with licenses and option of generating free to air ASI Output for monitoring. (iii) Minimum Eight Independent IP data Port (bi-directional) with licenses (for Input data, Independent MPEG-2 TS over IP Output for transmission, Anncellary data, Control & Management) ~~(iv) Minimum four nos 10 Gigabit SFP Port (Bi-directional) with device~~ (v) DVB- CSA(V1 & V2) compliant generic CAS encryption and Minimum two DVB-CAS simulcrypt scrambler licenses with ECM & EMM and generic CAS enabled ASI Outputs.	8	Sets		
b	32 input and corresponding 32 output Ports HD-SDI Patch Panels (75 Ohm Impedence) for connecting all Input Ports and Output Ports of IP incapsulators and ASI Router as per DRG no. 11,12,13,& 13A. (Normal Through, self terminating type)	8	Sets		
c	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 11,12,13,& 13A) for interconnection of IP Encapsulators, ASI Router and up to input of the Satellite Modulator..	8	Lots		
15	**16x16 or better matrix ASI router (SDI compatible) wired for all input and out put consisting of:**				
a	Base unit fully wired for 16x16 or better matrix Input and Output	8	Sets		
b	Inbuilt controller/ logic modules	8	Sets		
c	Inbuilt auto switchable Redundant Power supply unit	8	Sets		
d	X-Y control panel with cable	8	Sets		
e	Single Bus remote control panel with cable	8	Sets		
16	**Network Management System(NMS) for Compression equipment consisting of:**				
a	Compression equipment control system Software	8	Sets		
b	Compression equipment control system Hardware consisting of rack mounted main server in 1+1 master-slave configuration or Cluster configuration having minimum 3 servers for high availability with client license, each server with dual power supply modules; and KVM switch, Integrated Key Board , mouse & rack mount foldable display monitor.	8	Sets		
c	Client work station with required licenses for remote monitoring of all NMS	4	Sets		
d	24 port IP Network switch for NMS monitoring with Client Work station in remote locations	4	Sets		
e	Indoor type CAT-6 Cable with connector as per site requirement and DRG No. 11,12,13 and 13A. (Min 100 meter per set)	4	Sets		
f	Indoor type CAT-6 Cable with connector between 24 port IP Network switch connected in the output of NTP Server *and IP Network switch* for network time synchronisation of compression system, Monitoring system DRG No.4,11,12,13 13A and 19 (Min 9x25 mtr per set for Compression system cable i.e.(9x25x2)=450 mtr	1	Sets		

g	Indoor type CAT-6 Cable with connector between 48 port IP Data switch connected with EPG and PSI/SI Generator/Server and IP Data switch for feeding data to compression system; and Multiviewer for monitoring of IP streams as per site requirement and DRG No. 4,11,12,13,13A. (Min 9x25 mtr per set for Compression system cable i.e. (9x25x2)=450 mtr	1	Sets		
h	Indoor type CAT-6 Cable with connector between 48 port IP Data switch connected with IP Router and 48 port IP Data switch connected with Encoders as per site requirement and amended DRG No. 4,11,12,13 13A and 19. (Min 3x9x25 mtr per set i.e. (3x9x25)=675 mtr)	1	Sets		
17	**Bi-directional SRT based Gateway System -**				
a	Bi-directional SRT based Gateway System in (1+1) configuration to Send & Receive MPEG transport stream (between DD FreeDish (DRC) Hyderabad and DD FreeDish (Main) Todapur Delhi). SRT based Gateway System consists of-				
i	1- Server Based, Bi-directional SRT Sender Gateway System in (1+1) configuration, dedicated to send eight numbers of MPEG transport streams from DD FreeDish Earth Station (DRC) Hyderabad to DD FreeDish Earth Station (Main) Todapur Delhi. 2- Server Based, Bi-directional SRT Receiver Gateway System in (1+1) configuration, dedicated to receive eight numbers of MPEG transport streams from DD FreeDish Earth Station (Main) Todapur Delhi to DD FreeDish Earth Station (DRC) Hyderabad. Note- These Gateway systems shall be commissioned at DD FreeDish Earth Station (DRC) Hyderabad. Internet Connectivity between DD FreeDish (DRC) Hyderabad and DD FreeDish (Main) Todapur Delhi will be provided by Doordarshan.	1	Sets		
ii	1- Server Based, Bi-directional SRT Sender Gateway System in (1+1) configuration, dedicated to send eight numbers of MPEG transport streams from DD FreeDish Earth Station (Main) Todapur Delhi to DD FreeDish Earth Station (DRC) Hyderabad. 2- Server Based, Bi-directional SRT Receiver Gateway System in (1+1) configuration, dedicated to receive eight numbers of MPEG transport streams from DD FreeDish Earth Station (DRC) Hyderabad to DD FreeDish Earth Station (Main) Todapur Delhi. Note- These Gateway systems shall be commissioned at DD FreeDish Earth Station (Main) Todapur Delhi. Internet Connectivity between DD FreeDish (DRC) Hyderabad and DD FreeDish (Main) Todapur Delhi will be provided by Doordarshan.	1	Set		
b	Indoor type CAT-6 Cable with connector as per site requirement and suggestive Block Diagram No. 4- i- Min 60 meter per set (6x10 meter) from SRT based Gateway System to 48 port IP Data switch connected with IP router at DD FreeDish Earth Station (DRC) Hyderabad. ii- Min 60 meter per set (6x10 meter) from SRT based Gateway System to 48 port IP Data switch connected with IP router at DD FreeDish Earth station Todapur Delhi.	1	Set		

c	HD-SDI Video cables with matching connectors as per site requirement and suggestive Block Diagram No. 11,12,13,13A- i- HD-SDI Video cables with matching connectors as per site Requirement for interconnection of 16x16 ASI Router/patch panel to SRT based Gateway System at DD FreeDish Earth Station (DRC) Hyderabad. ii- HD-SDI Video cables with matching connectors as per site Requirement for interconnection of ASI Router/patch panel to SRT based Gateway System at DD FreeDish Earth station Todapur Delhi.	1	Set		
18	Essential items/Works (If any) to complete the installation of Compression system	1	Lot		
19	Installation , testing and system integration of Compression System	1	Job		
~~20~~	**~~GPS Enabled NTP Server and associated accessories consisting of:~~**				
a	Two nos. GPS enabled NTP servers with dual redundant Power supply and GPS Antenna with associated accessories for network time synchronization of all broadcast equipment and servers installed in the earth station.	1	Sets		
b	24 port IP Network switch to be connected in the output of NTP Server for network time synchronisation of all IP Network switches of four new compression system and two old compression system, Monitoring system and other associated equipment	1	Set		
c	Indoor type CAT-6 Cable with connector as per site requirement and DRG No. 10 (Min 3x10 meter per set for four new Compression system and 3x50 mtr per set for two old Compression system cable i.e. (3x10x4)+(3x50x2)=420 mtr	1	Lot		
21	**EPG and PSI/SI Generator/Server consisting of:**		Sets		
a	EPG and PSI/SI Generator/Server, in (1+1) configuration with associated hardware & software, for Insertion of EPG on weekly basis for 250 TV channel and Insertion of private data of DVB compliant Conditional Access System (CAS) in symulcript mode into multiple transport stream i.e. minimum eight	1	Sets		
b	Hot Swappable Dual Redundant Power Supply Unit in each Chasis	1	Lot		
c	48 port IP Data switch in (1+1) configuration to be connected with EPG and PSI/SI Generator/Server for feeding data to IP data switches & IP Encapsulator of four new compression system and two old compression system; and Multiviewer for monitoring of IP streams	1	Set		
d	Indoor type CAT-6 Cable with connector as per site requirement and DRG No. 10 (Min 3x10 meter per set for four new Compression system and 3x50 mtr per set for two old Compression system cable i.e. (3x10x4)+(3x50x2)=420 mtr	1	Lot		
C	**Digital Satellite Modulator System.**				
22	**Digital Satellite Modulators in 8x(1+1) configuration consisting of:**				
a	Digital Satellite Modulators capable of Modulating in DVB-S and DVB-S2 (one at a time) and operating in Redundant mode.	16	Nos.		
b	IF Redundancy switch for managing redundancy of (1+ 1) Modulators	8	Nos.		
c	1:4 IF Splitter (8 main + 2 standby)	10	Nos.		
23	Essential items/Works (If any) to complete the installation of Digital Satellite Modulator system.	1	Lot		
24	Installation , testing and system integration of Digital Satellite Modulator system.	1	Job		
D	**RF System**				
25	**IF to L- Band Up converter with internal/ External IF redundancy Switch 8x(1+1) configuration and operating in Redundant mode consisting of**				

a	IF to L Band Up-converter in (1+1) configuration operating in Redundant mode	8	Sets		
b	L Band Redundancy switch (Internal or External) for managing redundancy of (1+ 1) L- Band Up-converters	8	Sets		
c	Flexible copper IF Band cable with suitable connectors (75 ohms) from IF spliiter to IF patch panel at Up-converters rack:- 18x15 mtrs = 270 mtrs (min.).	1	Lot		
d	Flexible copper L Band Cable with suitable connectors (50 ohms) from Up-converters to HPA racks:- 2x40 mtrs = 80 mtrs (min.) (One main and one Standby)	3	Lots		
e	4:1 RF Combiners(L Band) along with suitable termination (Two main + Two cold stanby)	4	Nos.		
f	1:4 IF Splitters along with suitable termination as cold stanby	4	Nos.		
g	2:1 RF passive Combiners(L Band) along with suitable termination	2	Nos.		
h	1:2 RF passive Splitters (L Band) along with suitable termination	2	Nos.		
i	12 port (min) IF patch panel with matching connector	2	Nos.		
j	Essential items /works (If any) to complete the installation of Upconverters	1	Lot		
k	Installation of above Up-converters and redundancy switches and integrating it with HPA System.	1	Job		
26	**L band to Ku band Block Up-converter (BUC) Unit in (1:1) configuration (indoor Type) with internal/ External redundancy Switch operating in Redundant mode consisting of**				
a	L band to Ku band Block Up-converter (BUC) Unit in (1:1) configuration (indoor Type) operating in Redundant mode (Internal/ External with HPA system)	3	Sets		
b	RF (Ku Band) Redundancy switch (Internal or External with BUC Unit) for managing redundancy of (1+ 1) L to Ku Band Up-converters	3	Sets		
c	Flexible copper L Band Cable with suitable connectors (50 ohms) from L band splitter to IL band to Ku band Block Up-converter (BUC) :- 6x10 mtrs = 60 mtrs (min.).	1	Lot		
d	Flexible copper Ku Band Cable with suitable connectors (50 ohms) from Ku band Block Up-converter (BUC) to HPA racks:- 6x10 mtrs = 60 mtrs (min.) (One main and one Standby)	3	Lots		
e	Essential items /works (If any) to complete the installation of Upconverters	1	Lot		
f	Installation of above Up-converters and redundancy switches and integrating it with HPA System.	1	Job		

27	**Ku- Band High Power Amplifiers (HPAs) SYSTEM (With supplemental power/redundant chassis) consisting of :-**				
a	**In case of High Power Amplifiers (HPAs) SYSTEM is Solid State Power Amplifier (SSPA) based** *[Note- HPA SYSTEM shall have multiple main HPA chassis, required to give rated RF output power to get the required Rain Fade Margin , along with integrated supplemental power , so that on failure of 25% (in equal or next whole numbers) of main chassis, HPA SYSTEM shall be able to provide rated RF output power to get the required Rain Fade Margin automatically with supplemental power consisting of -*				
i	Ku-band HPAs with integrated supplemental power for up linking of 4 Carrier of 36 MHz Bandwidth	2	Sets		
ii	Ku-band HPAs with integrated supplemental power for up linking of 1 Carrier of 36 MHz Bandwidth	1	Set		
	OR				
a	**In case of High Power Amplifiers (HPAs) SYSTEM is Traveling Wave Tube Amplifier (TWTA) based:-** *HPA SYSTEM shall have multiple main HPA chassis, required to give rated RF output power to get the required Rain Fade Margin , along with integrated redundant chassis (similar to Main HPA chassis) or with integrated supplemental power, so that on failure of 25% (in equal or next whole numbers) of main chassis, HPA SYSTEM shall be able to provide rated RF output power to get the required Rain Fade Margin automatically with redundant chassis consisting of-*				
i	Ku-band HPAs with integrated redundant chassis (similar to Main HPA chassis) or with integrated supplemental power for up linking of 4 Carrier of 36	2	Sets		
ii	Ku-band HPAs with integrated redundant chassis (similar to Main HPA chassis) for up linking of 1 Carrier of 36 MHz Bandwidth	1	Set		
b	RF waveguide system consisting of waveguide switches along with all necessary dummy loads of required ratings and waveguide interconnectors, cooling fans etc. for HPA system of four Carriers up link system.	2	Lots		
c	RF waveguide system consisting of waveguide switches along with all necessary dummy loads of required ratings and waveguide interconnectors, cooling fans etc. for HPA system of one Carrier up link system.	1	Lot		
d	High Power Dummy Load, flange WR-75, Ku-Band, 3 Kw (min) or as per requirement of solution for HPA system (which ever is higher) of four Carriers up link system.	2	Nos.		
e	High Power Dummy Load, flange WR-75, Ku-Band, 1 Kw (min) or as per requirement of solution for HPA system (which ever is higher) of one Carrier up link system.	1	No		
f	Interconnecting High Power rigid waveguide assembly and Attenuators/Terminations for offered HPA System and integrating with up-link Antenna System as per DRG No.16.	1	Lot		
g	Supply and installation of aluminum duct or HDPE pipe as per site requirement to take out hot air of each HPA from HPA rack to outside the room. (Min length 4 mtr)	3	Lots		

15/05/21

h	Terminations and other required accesssories between BUC and HPA.	3	Lots		
i	19" wired racks for HPA system from the HPA OEM for mounting eqpt ergonomically in orderly fashion and necessary circuit breakers. (One set for four carrier,second set for another four carrier and third set for one carrier HPA system)	3	Sets		
28	Essential items /works (If any) to complete the installation of HPA system	1	Lot		
29	Installation of above HPAs and integration with Uplink antenna System.	1	Job		
30	~~Automatic Dehydrator (3-5 PSI user configurable) with required accessories~~ and front panel display with remote access through Ethernet/SNMP etc and rack mounting kit	2	Set		
31	**Waveguides and Componenets consisting of :**				
a	Flexible waveguide (WR 75) with suitable flange connectors (Average Power handling capacity >=3.0 KW) (as per site requirement) consisting of:				
(i)	Length- 1 meter (min) - 8 nos. [Flat connector (WR75) at both ends of waveguide]	1	Set		
(ii)	Length- 1 meter (min)- 8 nos. [Flat connector (WR75) at one end & Grooved connector at other end of waveguide]	1	Set		
(iii)	Waveguide E-Plane bend	8	Nos		
(iv)	Waveguide H-Plane bend	8	Nos		
(v)	Waveguide Twist of 90 deg. (WR75) (4 Nos. clockwise and 4 Nos. anticlockwise)	8	Nos		
b	Flexible waveguide (WR 75) with suitable flange connectors (Average Power handling capacity >=1. 5 KW) (as per site requirement) consisting of:				
(i)	Length- 1 meter (min) - 4 nos. [Flat connector (WR75) at both ends of waveguide]	1	Set		
(ii)	Length- 1 meter (min)- 4 nos. [Flat connector (WR75) at one end & Grooved connector at other end of waveguide]	1	Set		
(iii)	Waveguide E-Plane bend	4	Nos		
(iv)	Waveguide H-Plane bend	4	Nos		
(v)	Waveguide Twist of 90 deg. (WR75) (Rate to be quoted per unit basis) (2 Nos. clockwise and 2 Nos. anticlockwise)	4	Nos		
32	Ku Band Automatic Uplink Power Control system (AUPC System) along with required accessories like required attenuator (if any), cable with connector etc	3	Set		
33	**RF Equipment Control and Management System (RF NMS) with switching & interlock facility for RF Equipment consisting of-**				
a	**To be supplied , installed and commissioned at DD FreeDish (DRC) Hyderabad-**				
i	RF Equipment Control system and Management System with switching/interlock facility Software at DD FreeDish Earth Station (DRC) Hyderabad.	1	Set		

42	Earthing system and earth pits for PDAs. (Each Set consists of minimum 2 Nos i.e. Earth pits would consist of Copper Earth electrode (diameter 20 mm (min)), insulated copper strip/ wire (50 Sq. mm (Min)), Chemical earth fill compound with fast discharge characteristics, water absorbing gel, perforated Hard HDPE pipe (diameter 40 mm), funnel, 10 feet depth and 1 feet diameter. Earth pit would be prepared so that earth resistance is less than 1 ohm *Sample picture is enclosed at DRG No.26.*	2	Set		
43	16 sq mm 4 core , Armoured copper power supply cable, from PDP to Uplink antenna control panel. (Min length 70 mtr per set) (as per site requirement)	2	Sets		
44	Power supply cable with copper conductor from Uplink antenna control panel to Drive Motors of PDA. (Min. 10 meter per set)	2	set		
45	40 dB Directional couplers (# 40 dB Cross guide directional coupler Operating Frequency: 13.75 to 14.50 GHz Connector: N type Female Coupled Port Flange: input WR75 / output WR75) (4 Nos. will be installed + 1 No. cold standby)	5	set		
46	1:4 Ku Band Splitter 2 Nos for Antenna No 1 (V Pole & H Pole) and 2 Nos for Antenna No 2 (V Pole & H Pole) + 2 Nos as Cold standby.	6	Nos.		
47	Any other essential item/Job to complete the installation and commissioning of Uplink Antenna system	2	sets		
F	**Receive Parabolic Dish Antenna System and accessories:**				
48	**Receive Parabolic Dish Antenna (PDA) (Motorised manual) and accessories consisting of:**				
a	C band 4.5 to 4.8 meter Manual drive motorized Receive Parabolic Dish Antenna System	18	Sets.		
b	C-Band dual port Linear orthogonal feed	18	Sets		
c	C-Band LNBC (36 Nos will be installed +4 Nos Cold Standby)	40	Nos.		
d	Out door type Manual Antenna control unit with connecting cable for manual orientation of the above PDA	18	Sets.		
e	Low loss L band cable with matching connector with Gold plated Pin as per site requirement (50 meters per antenna 50x8x2=800 mtrs (min.) with laying overhead/matching from LNBC of Receive PDAs to L-band Patch Panel in Compression Room.	1	Lot		
f	Lightning Arrestor with Cable and accessories for Receive PDA	18	Sets.		
g	Cable Lables to Delineate on all RF Cables to be place at every 5 meters	1	Set		
h	Installation of Receive PDA including foundation (Material and labour) (above 500mm from ground) , connecting earthing & Lightening arrester, Power supply cable with copper conductor from Receive antenna control panel to Drive Motor of PDA.(Min 10 mtr per Set) The foundation drawing of PDA shall be approved by OEM of PDA.	18	Lot		
i	16 sq mm 4 core , Armoured copper power supply cable, from PDP to Receive antenna control panel. (Min length 70 mtr per set) (as per site requirement)	18	Sets		

49	**C-Band Interference Rejection Band Pass Filter (3.7 GHz to 4.2 GHz with 30 MHz Guard Band) with gasket and mounting kit (36 Nos will be installed +4 Nos Cold Standby)**	40	Sets		
50	Earthing system and earth pits for 18 Nos Receiving PDAs. (Each Set consists of minimum 2 Nos. of Earthing system Earth pits would consist of Copper Earth electrode (diameter 20 mm (min)), insulated copper strip/ wire (50 Sq. mm (Min)), Chemical earth fill compound with fast discharge characteristics, water absorbing gel, perforated Hard HDPE pipe (diameter 40 mm), funnel, 10 feet depth and 1 feet diameter. Earth pit would be prepared so that earth resistance is less than 1 ohm *Sample picture is enclosed at DRG No.26.*	18	Set		
51	**Receive Parabolic Dish Antenna (PDA) (Motorised Autotracking) and accessories consisting of:**				
a	C band 4.5 to 4.8 meter Manual drive motorized Receive Parabolic Dish Antenna System	2	Sets.		
b	C-Band dual port Linear orthogonal feed	2	Sets		
c	C-Band LNBC	4	Nos		
d	L- band BTR & Antenna control unit for quick orientation of the receive PDA	2	Sets.		
e	Out door Antenna control unit with connecting cable for Auto orientation of the above PDA	2	Sets.		
f	Low loss L band cable with matching connector with Gold plated Pin as per site requirement (50 meters per antenna total 50x2x2=200 mtrs (min.) with laying overhead/matching from LNBC of Receive PDAs to L-band Patch Panel in Compression Room.	1	Lot		
g	Lightning Arrestor with Cable and accessories for Receive PDA	2	Set		
h	Cable Lables to Delineate on all RF Cables to be place at every 5 meters	1	Set		
i	Installation of Receive PDA including foundation (Material and labour) (above 500mm from ground), connecting earthing & Lightening arrester, Power supply cable with copper conductor from Receive antenna control panel to Drive Motor of PDA (Min 10 mtr per Set) The foundation drawing of PDA shall be approved by OEM of PDA.	2	Lot		
j	16 sq mm 4 core , Armoured copper power supply cable, from PDP to Receive antenna control panel. (Min length 70 mtr per set) (as per site requirement)	2	Sets		
52	**C-Band Interference Rejection Band Pass Filter (3.7 GHz to 4.2 GHz with 30 MHz Guard Band) with gasket and mounting kit**	4	Sets		
53	Earthing system and earth pits for all Receiving PDAs. (Each Set consists of minimum 2 Nos. Earth pits would consist of Copper Earth electrode (diameter 20 mm (min)), insulated copper strip/ wire (50 Sq. mm (Min)), Chemical earth fill compound with fast discharge characteristics, water absorbing gel, perforated Hard HDPE pipe (diameter 40 mm), funnel, 10 feet depth and 1 feet diameter. Earth pit would be prepared so that earth resistance is less than 1 ohm *Sample picture is enclosed at DRG No.26..*	2	Set		
54	Providing & installing support tray & cable tray with cover for all receive antennas (20 Nos) , suitably painted as per site requirement (for laying of all cables (Power, L band, Optical) from each antenna to compression Room).	1	job		

ii	RF Equipment Control and Management System (RF NMS) with switching & interlock facility Hardware consisting of rack mounted main server in 1+1 master-slave configuration or Cluster configuration having minimum 3 servers for high availability with client license, each server with dual power supply modules; and KVM switch, Integrated Key Board , mouse & rack mount foldable display monitor installed and commissioned at DD FreeDish (DRC) Hyderabad.	1	Set		
iii	Client work station with required licenses for monitor & manage the entire RF sub-system and integrate for Geo-redundant rain diversity system with DD FreeDish (Main) Todapur Delhi and vise versa	1	Set		
iv	24 port IP Network switch for NMS monitoring with Client Work station in remote locations installed and commissioned at DD FreeDish (DRC) Hyderabad.	1	Set		
v	Indoor type CAT-6 Cable with connector as per site requirement at DD FreeDish (DRC) Hyderabad. (Min 100 meter per set)	1	Set		
vi	IP Network Switch 48 port with inbuilt dual power supply unit with Rack mounting kit for Monitoring Room. (at DD FreeDish (DRC) Hyderabad)	1	Set		
b	**To be supplied , installed and commissioned at DD FreeDish earth Station (Main) Todapur Delhi -**				
i	RF Equipment Control system and Management System with switching/interlock facility Software installed and commissioned at DD FreeDish earth Station (Main) Todapur Delhi..	1	Set		
ii	RF Equipment Control and Management System (RF NMS) with switching & interlock facility Hardware consisting of rack mounted main server in 1+1 master-slave configuration or Cluster configuration having minimum 3 servers for high availability with client license, each server with dual power supply modules; and KVM switch, Integrated Key Board , mouse & rack mount foldable display monitor, installed and commissioned at DD FreeDish earth Station (Main) Todapur Delhi.	1	Set		
iii	Client work station with required licenses for monitor & manage the entire RF sub-system and integrate for Geo-redundant rain diversity system with DD FreeDish (Main) Todapur Delhi and vise versa	1	Set		
iv	24 port IP Network switch for NMS monitoring with Client Work station in remote locations installed and commissioned at DD FreeDish earth Station (Main) Todapur Delhi..	1	Set		
v	Indoor type CAT-6 Cable with connector as per site requirement installed and commissioned at DD FreeDish earth Station (Main) Todapur Delhi. (Min 100 meter per set)	1	Set		
vi	IP Network Switch 48 port with inbuilt dual power supply unit with Rack mounting kit for Monitoring Room at DD FreeDish earth Station (Main) Todapur Delhi.	1	Set		
34	Essential items/works (if any) to complete the installation of RF Control system	1	Lot		
35	Installation of RF Control System and integration with Satellite Modulators, Up Convertors, HPAs.	1	Job		

15/05/25

E	**ANTENNA SYSTEM**				
36	**Uplink Parabolic Dish Antenna (PDA) with Motorised Autotracking system and Accessories consists of**				
a	9.0 meter to 9.4 meter Motorised Autotracking Uplink antenna	2	Nos.		
b	Ku-Band 4 Pole Linear polarized feed (Motorized)	2	Nos.		
c	Trans reject filter coupler for both receive ports for above feed (if required)	4	Nos.		
d	Trans directional coupler for both uplink ports for above feeds	4	Nos.		
e	2+1 Redundant Ku-Band LNA System [i.e. each set consisits of 3 Nos of Ku-Band LNAs with associated accessories]	2	Sets		
f	Automatic antenna control unit for quick orientation of the above Uplink PDA	2	Nos.		
g	Low loss RF cable *1/2 inch (As per site requirement)*	20	Meter		
h	Beacon Tracking Receiver (BTR) (Ku-Band)	2	Nos.		
i	Bird Guard for feed	2	Nos.		
j	Lightning Arrestor with cable and accessories for Uplink PDA	2	Nos.		
37	Construction of foundation (Material and Labour) of Uplink PDAs with raised platform (tentatively 4 mtr from the ground) for installation of Uplink PDAs. (So that HPAs and related RF equipment shall be installed in the space (hall) below PDA). The foundation drawing of PDA shall be approved by OEM of PDA. The ceiling of the hall below PDA should be minimum 10 feet height alongwith elctrical wiring and fittings (for proper illumination), false ceiling, flooring (Heavy duty aesthetic Tile work), Painting and all four sides (walls door and windows) are as per technical requirement of equipment and climatic requirement of site. Please see suggestive DRG No. 17	2	Job		
38	Construction of roof on the space between both PDA foundation by RCC for installation of the ancillary equipment of RF system/monitoring and control of RF system . The ceiling of the hall should be minimum 10 feet height alongwith elctrical wiring and fittings (for proper illumination), false ceiling, flooring (Heavy duty aesthetic Tile work), Painting and all four sides (walls, door and windows) are as per technical requirement of equipment and climatic requirement of site.. The distance between centre of the foundation of Uplink PDAs should be 15 m ± 1m. Please see suggestive DRG No. 17	1	Job		
39	Maintinance Platform and Ladder Kit for Uplink Antenna	2	set		
40	Installation (material and work) of uplink Antenna system including all related works like connecting earthing, Lightening arrester, Cable Tray etc and laying of waveguide from both ports of Uplink antenna to HPA Systems.	2	set		
41	NOCC clearance of the installed Up-link Antenna	2	sets		

55	Installation material and laying of cables protection pipes for all receive antennas (20 Nos)	1	Job		
56	Essential items/Works (If any) to complete the installation of Receive Parabolic Dish Antenna System	1	Lot		
57	Testing and system integration of Receive Parabolic Dish Antenna System.	1	Job		
G	**Monitoring System**				
58	**Ku- Band receive setup for down link monitoring consisting of**				
a	Ku- band receive antenna 120 cm with LNBF	5	Sets		
b	Ku- band receive antenna 90 cm with LNBF	5	Sets		
c	Ku- band receive antenna 60 cm with LNBF	5	Sets		
d	Installation material for 15 sets Antennae supplied above under line item (a) (b) & (c)	1	Lot		
e	RF cables with connector as per site requirement (minimum 15x20=300 mtrs)	1	Set		
59	Essential items/Works (if any) to complete the installation of Ku band Receive Antenna system	1	Lot		
60	Installation, testing and system integration of Ku band Receive Antenna System	1	Job		
61	**Confidence level Monitoring system consisting of:**				
a	17 Inch (Nominal) LCD (TFT/OLED) Professional Broadcast Colour Monitor with integrated speakers with rack mounting Kit	3	Set		
b	Professional grade Integrated Audio/video Monitor with >= 3.4'' TFT/OLED/LCD screen of high resolution and integrated speakers. It should accept 2 HD/SD-SDI Inputs with reclocked output, including audio De-Embedder, decoding of Dolby digital (AC-3) 5.1 audio and Dolby Digital Plus 5.1 Audio, and shall also accepts MPEG streams over IP (RJ45) input and shall decode compressed video in MPEG2, H.264 & HEVC and audio in MPEG Layer 1/2/3, AAC and Dolby audio for up to 5.1 channel. (3 Nos. shall be used for monitoring at Hyderabad and two system shall be used for monitoring at DD FreeDish Todapur Delhi)	5	Nos.		
c	Monitoring Demod cum Decoder {with L-band inputs of DVB-S & DVB-S2, DVB-ASI & IP Input (MPEG 2 TS over IP) } with DVB-ASI, SD-SDI, HD-SDI, AES/EBU, HD SDI embedded audio, SD-SDI embedded audio, One downconverted SD-SDI of HD-SDI, Dolby digital (AC-3) 5.1 audio & Dolby Digital Plus 5.1 Audio (E-AC-3) output, MPEG-2 TS over IP output with Multi service filtering facility and having 4:2:0 & 4:2:2 compliant for MPEG-2, H.264/MPEG-4-AVC and 4:2:0 compliant for H.265/HEVC decoding and Common Interface slot hardware, BISS mode-1 & BISS-E Compliant and dual Redundant Power supply unit. Note: One Monitoring Demod cum Decoder shall be mounted in one chassis. 12 decoders are use for monitoring and 8 are cold standby.	8	Nos.		

d	Multi viewer display system with IP Inputs (MPEG-2 TS over IP) streams of Down link signal monitoring. Multiviewer shall have inbuilt MPEG-2 & MPEG-4 decoders of 16 SDTV with emmbedded audio including MPEG-4 & HEVC decoders of 8 HDTV with Dolby Digital (AC-3) 5.1 audio/ Dolby Digital Plus 5.1 audio Channels (To be installd in RF Monitoring Room)	1	Set		
e	Laptop with Intel Core i3, 4GHz or better, 5 Cores min, RAM:8 GB, 1 x 8 GB, DDR4, Storage:512GB SSD with associated accessories	2	Set		
f	24x7 Industrial Grade, Professional Broadcast 55" (nominal) LCD (LED/OLED) display wall system along with mounting kit , (To be installd in RF Monitoring Room and Compression Room)	2	Sets		
g	Interconnecting cables from Multi viewer system to 55" (nominal) LCD (LED/OLED) display wall system for display of each Multiviewer output as per DRG no. 19	1	Set		
h	Installation of 55" (nominal) LCD Monitors	1	Job		
i	DVB-S(QPSK) and DVB-S2(QPSK & 8PSK) compliant Demodulator having 8 Independent frequency (L Band) tuner (Minimum) simultaneously with MPEG-2 TS over IP output.	2	Sets		
j	High Quality Digital Audio Amplispeaker having SDI with Emmbedded Audio, AES/EBU and Analog Input facility with suitable Power Supply	2	Set		
k	Test Loop Translator (TLT) (Ku-band U/L to L-band)	3	Nos.		
l	64 x 32 SDI Router with one X-Y pannel, one Single Bus Remote Control Panel, dual Redundant power supply and acccessories	1	Set		
m	32 input and corresponding 32 output Ports HD-SDI/ASI Patch Panel , 75 Ohm Impedence as per DRG no. 18 (1RU, Normal Through, self terminating type)	10	Sets		
n	19" Rack mount 24 Port IP Patch Panel with RJ 45 Connector	1	Sets		
o	IP Patch cord with connector (RJ-45)	6	Set		
62	**Input and Downlink Monitoring of SDTV and HDTV Channels consisting of:**				
a	Multi viewer display system with remote panel for IP Inputs (MPEG-2 TS over IP) and [RTMP, SRT, HLS (inbuilt or external decoder)] streams of Input Source signal + 1 no DVI Input+2 Nos SDI Input. Each set of Multiviewer shall have inbuilt MPEG-2 & MPEG-4 decoders of 40 SDTV with emmbedded audio including MPEG-4 & HEVC Main-10 decoders of 16 HDTV with Dolby Digital (AC-3) 5.1 audio/ Dolby Digital Plus 5.1 audio Channels. Multiviewer shall have two independent video display outputs; and display the name of all channels with their alrams including major alarms on separate monitor as per DRG no. 19.	8	Set		
b	Work station with software licences including one client Licence for controls and cofiguration of Multiviewer System and Display on 55" Display system	1	Set		

e	De-Modulator cum Descrambler unit (DVB-S & S2) with Common interface slot hardware (Max 8 Service per CI slot) for 40 TV service and 8 Radio service per Stream per set (one chassis should consist of multiple modules). If De-Modulator & Descrambler offered in separate chassis shall also be acceptable.	8	Sets		
d	Multi viewer display system with remote panel for IP Inputs (MPEG-2 TS over IP) and [RTMP, SRT, HLS (inbuilt or external decoder)] streams of Down link signal + 1 no DVI Input+2 nos SDI Input. Each set Multiviewer shall have inbuilt MPEG-2 & MPEG-4 decoders of 40 SDTV with emmbedded audio including MPEG-4 & HEVC decoders of 16 HDTV with Dolby Digital (AC-3) 5.1 audio/ Dolby Digital Plus 5.1 audio Channels. Multiviewer shall have two independent video display outputs; and display the name of all channels with their alrams including major alarms on separate monitor as per DRG no. 19.	8	Sets		
e	Work stations with software licences including one client licence for controls and cofiguration of Multiviewer System and Display on 55" Display system	1	Set		
f	IP Data Switch 48 port with inbuilt dual power supply unit and rack mounting kit.	1	Set		
g	Active splitter(L- band) (1:12) ie. 1-input and 12 output with DC Block and dual Redundant Power Supply.	5	Nos.		
h	1:4 ASI passive splitters	4	Sets		
i	24x7 Industrial Grade, Professional Broadcast 55" (nominal) LCD (LED/OLED) display wall system along with mounting kit	16	Sets		
j	Interconnecting cables from Multi viewer system to 55" (nominal) LCD (LED/OLED) display wall system for display of each Multiviewer output as per DRG No. 19	1	Set		
k	Installation of 55" (nominal) LCD Monitors	1	Job		
l	42/40 inch (nominal) LED display system having Full HD, 1920 x 1080 Pixels, DVB, PAL, Video Signals HDMI, RF, Component, Sound Type 2.0, Stereo, Audio Formats Supported AAC, AC3(Dolby Digital), EAC3, HAAC, MP3, MPEG, PCM, Inbuilt Speakers-2, USB port 2 (min) Supports Audio, Video, Image; HDMI Ports 2 (min), with mounting stand	6	Sets		
m	Supply and Installation of movable monitoring stand with matching material 42/40 inch (nominal) LED display system	2	Sets		
63	Ku-Band (Downlink) to L-Band Down Converters	8	Sets		
64	70 MHz IF to L-Band Upconverter	2	Sets		
65	Dolby Digital 5.1 audio (400W (nominal) ,Bluetooth & USB Connectivity, HDMI & Optical connectivity) high quality Home Theater	1	Set		
66	Essential items/Works (If any) to complete the installation of above Mmonitoring System	1	Lot		
67	Installation , testing and system integration of Monitoring System	1	Job		

15/05/25

H	**MEASURING EQUIPMENT**				
68	Multi format Digital SD & HD Video & Audio Test pattern generator	1	Set		
69	Digital waveform monitor (with Measurement facility)	1	set		
70	MPEG Real Time Transport Stream Analyser cum monitor (950 MHz to 2150 MHz min)	1	set		
71	300 Channel video logger with minimum 90 days content storage facility and required software & licenses High-quality broadcast off-air recording system (TS logger (native transport stream), SDI logger and ASI logger) for 300 SDTV channel including 16 HDTV channel with 4 four stereo audio having facility to record HDTV Channel with Dolby digital 5.1 & Dolby Digital Plus 5.1 audio and one stereo audio channel, with minimum 90 days content storage facility and required software & licenses	1	set		
72	Real Time Signal Analyzer (9kHz to 26.5 GHz or better) with required probe and acessories.	1	Set		
73	Spectrum Analyzer (9kHz to 26.5 GHz or better) with required probe and acessories.	1	Set		
74	Portable Handheld Ku Band RF power meter along with power sensors , For measuring the RF power (CW, average and peak)	1	Set		
75	3db Fixed Attenuator BNC to BNC	2	Nos		
76	6db Fixed Attenuator BNC to BNC	2	Nos		
77	Variable attenuator 0 to 110dB with 1 dB step	2	Nos		
78	Fiber Optic Splicing Machine along with relevant KIT and required accessories like splice protection sleeves packet (consist of min 1000 Pc splice protection sleeves) etc.	1	Set		
79	The test, measuring and maintenance equipment for Optical Fiber and Ethernet link (copper) system, should consist of Micro-Fiber Optic end face Inspection Scope, Cleaning kit, Optical Power meter for Multimode and single mode, Portable handheld Ethernet tester, along with their essential accessories like RJ45-RJ45 patch cord, charger, RJ45/11 universal coupler, required probes, 1310/1550 single-mode source, SC, ST, and LC power meter adapters, carrying case etc(As per project requirement)	1	Set		
80	Colour laser Printer with network printing facility for A4 size	1	Set		
81	B/W laser printer with network printing facility for A3 size	1	Set		
82	Any other essential items/Works to complete the Measuring system	1	Lot		
83	Installation , testing and system integration of Measuring System	1	Job		
I	**POWER SUPPLY SYSTEM**				
84	200 KVA (3 phase) Uninterrupted Power Supply(UPS) operating in (1+0) redundant parallel load sharing mode with Battery backup of 15 minutes(Min.) for each UPS.The isolation transformer will be provided at the output of UPS , internally, for suitable rating(minimum 200 KVA) consisting of				
a	200 KVA UPS (3 phase) (one no per set)	2	Sets		

b	Battery bank (Min. 216000 VAH) with Battery Bank Stand(one set per UPS)	2	Set		
c	Internal Isolation transformer at the output of UPS(one set per UPS)	2	Nos		
d	UPS and Battery Changeover and Bypass switching system	2	Set		
85	Oil cooled AVR 300 KVA (3 phase) for UPS system.	1	Nos		
86	Oil cooled AVR 150 KVA (3 phase) for Air Conditioning, Light, PDAs	2	Nos		
87	Air cooled Isolation Transformer 300 KVA (Delta 3 phase to Star 3 Phase) at the input of 300 KVA AVR	1	Nos		
88	Minimum 150A 3 phase +Neutral Automatic Power/Transfer Switch with accessories for HPA system.	1	Sets		
89	**Power supply Cables, SDBs, PDPs etc consisting of**				
a	Supply, Laying and Integration of Power supply Cables (min. 300sq. mm, 4 Core Copper) (with connectors between 3 phase Main LT panel to Main PDP Panel through 300 KVA AVR & 300 KVA Isolation Transformer as per site requirement (Minimum length-50 mtr). as per DRG No. 20	1	Set		
b	Supply, Laying and Integration of Power supply Cables (min. 185sq. mm, 4 Core Copper) with connectors between 3 phase Main LT panel to 3 Phase SDB Panel for Antenna Control Outdoor Unit through 150 kVA AVR & AVR SDB 1 as per site requirement (Minimum length-50 mtr). as per DRG No. 20	1	Set		
c	Supply, Laying and Integration of Power supply Cables (min. 185sq. mm, 4 Core Copper) with connectors between 3 phase Main LT panel to AVR SDB 2 through 150 kVA AVR as per site requirement (Minimum length-50 mtr). as per DRG No. 20 .	1	Set		
d	Supply, Laying and Integration of four core copper power supplycables of all other equipment like ACs (Tech Area), Lights (Tech area) to AVR SDB 1 as per site requirement and DRG No.20. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
e	Supply, Laying and Integration of three core copper power supply cables (as per requirement of equipment) to connect all 22 PDAs through AVR SDB 1 as per site requirement and DRG No.20. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
f	Supply, Laying and Integration of three core copper power supply cables (as per requirement of equipment) of all other equipment like ACs (Tech/Non Tech Area), Lights (Tech/Non Tech area) through AVR SDB 2 as per site requirement and DRG No.20. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		

17/05/25

g	Supply, Laying and Integration of Power supply Cables (4 Core Copper) with connectors between pannel consisting 4 Pole Industrial MCCBs and UPS Bypass Swiches (both) as per site requirement.. (Minimum length-50 mtr). as per site requirement and DRG No. 20 . (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
h	Supply, Laying and Integration of Power supply Cables (4 Core/4 single core Copper) with connectors between pannel consisting 4 Pole Industrial MCCBs and 2x (1+0) UPS as per site requirement. . (Minimum length 30 mtr). as per DRG No. 20 .	1	Set		
i	PDPs for UPS-1 and for UPS-2 (to meet the requirement of distribution of supply to all offerd SDBs) and Supply, Laying and Integration of Power supply Cables (4 Core/ 4 single core Copper) with connectors between UPS Bypass Swiches (both) and PDPs (Minimum length-30 mtr) as per site requirement and DRG No. 20 . (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
j	Supply, Laying and Integration of Power supply Cables (4 Core/4 single cores Copper) with connectors between (1+0) UPS PDPs (Both) and all SDBs in compression room (Minimum length-30 mtr) as per site requirement and DRG No. 20 & 21. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
k	SDBs with industrial MCCBs & MCBs and Supply, Laying and Integration of three core copper power supply cables to connect & meet the requirement of all equipment supplied in Racks of compression Room connected with 2x (1+0) UPS power supply systems as per site requirement and DRG No.21.	1	Set		
l	Supply, Laying and Integration of Power supply Cables (4 Core Copper) with connectors between (1+0) UPS PDPs and all SDBs in monitoring and IT rooms (Minimum length-50 mtr). as per DRG No. 20 & 21. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
m	SDBs with industrial MCCBs & MCBs and Supply, Laying and Integration of three core copper power supply cables to connect & meet the requirement of all equipment supplied and installed in Monitoring Room & IT Room connected with 2x(1+0) UPS power supply systems as per site requirement and DRG No.21. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
n	Supply, Laying and Integration of Power supply Cables (4 Core Copper) with connectors between (1+0) UPS PDPs and all SDBs & 3 Phase automatic Transfer/Static Switch in HPA Room and RF control & Monitoring Room (Minimum length-50 mtr) as per site requirement and DRG No. 20 & 21. (Rating of the cable shall be decided as per load of equipment with 50% margin)	1	Set		

o	SDBs with industrial MCCBs & MCBs and Supply, Laying and Integration of three/four core copper power supply cables to connect & meet the requirement of all equipment supplied and installed in HPA Room and RF control & Monitoring Room connected with 2x(1+0) UPS power supply systems as per DRG No.21. (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	1	Set		
p	PDP (to meet the requirement of distribution of supply) with suitable rating MCCBs, Bus bar, Voltage and current indicator & meter (as per site requirement) to feed input power supply to 2X(1+0)UPS systems, Antenna conmtrol Units etc as per site requirement and DRG No. 20 .	1	Set		
q	PDPs (to meet the requirement of distribution of supply) with suitable rating MCCBs, Bus bar, Voltage and current indicator & meter (as per site requirement) and Supply, Laying and Integration of Power supply Cables (4 Core Copper) with connectors between 150KVA AVR and PDP (for PDA), and connected equipment as per site requirement. (Minimum length-2x25=50 mtr) as per site requirement and DRG No. 20 . (Rating of the cable shall be decided as per load of equipment with 50% nominal margin)	2	Set		
90	Essential items/Works (if Any) to complete the Power Supply system	1	Lot		
91	Installation , testing and system integration of Power Supply system	1	Job		
J	**AIR CONDITIONING SYSTEM**				
92	**Supply , installation, testing and commissioning of High Cooling Packaged type air-cooled air conditioners with outdoor (condensing unit) consisting of :-**				
a	4.5 to 5.5 TR with AHU (Actual capacity @ 18 DegC inside & 43.3 Deg Ambient with 50±5% RH) High Sensible Heat, Air conditioning , industrial grade systems (3 Phase) for 24x 7 operation in HPA Hall 1 (To be used as 3 Sets main and 1 Set standby) (Min)	4	sets		
b	4.5 to 5.5 TR with AHU (Actual capacity @ 18 DegC inside & 43.3 Deg Ambient with 50±5% RH) High Sensible Heat, Air conditioning , industrial grade systems (3 Phase) for 24x 7 operation in HPA Hall 2 (To be used as 3 Sets main and 1 Set standby) (Min)	4	sets		
c	2.0 to 2.5 TR Tower Type (Actual capacity @ 22 to 27 DegC inside & 43.3 Deg Ambient with 60±10% RH) comfort air conditioning (with 3 star BEE rating or better) industrial grade systems (3 Phase) for 24x7 operation in RF MONITORING, NMS & CONTROL HALL (To be used as 3 Sets main and 1 Set standby) *(Min)*	4	sets		
d	8.0 to 9.0 TR (Actual capacity @ 22 to 27 DegC inside & 43.3 Deg Ambient with 60±10% RH) comfort Air conditioning, commercial/industrial grade ductable High Sensible Heat cooling air conditioning systems for 24x7 operation for Compression Room. (To be used as 4 Sets main and 1 Set standby) *(Min)*	5	sets		
93	Any other essential item to complete the Measuring system	1	set		
94	Installation , testing and system integration	1	job		

K	MISCLLANEOUS ITEMS				
95	Control & operators table (for Main Monitoring Room) made of powder coated MS sheet or aluminium to install remote operations & control computer, Remote Control panels, 17" Monitor, monitoring panel with Ampli speaker , measuring Equipment panel and other relevant equipments. (as per site requirement)	1	Set		
96	Control & operators table made of powder coated MS sheet or aluminium to install remote operations & control computer, Remote Control panels, measuring Equipment panel and other relevant equipments (as per site requirement) at- 1-RF Monitoring, NMS and Controll Hall 2-HPA Hall- 1 3-HPA Hall- 2 4-Compression Room 5-IT and Maintenance Room	1	Set		
97	Supply and installation of electronic thermometer & electronic hygrometere in third party NMS inside on top of each rack along with remote configuration and alarm monitoring system as per DRG No. 25.	1	Set		
98	Temperature and Humidity Monitoring system computer for controls and monitoring of temperature and Humidity	1	Set		
99	IP Network Switch 48 port with inbuilt dual power supply unit along with rack mounting kit and required CAT 6 Cable & connectors, for control of temperature and humidity	4	Set		
100	Required no. of 19 ", 1000 mm (depth) equipment rack frames (min 50 nos rack) including Installation material audio video cables and matching HD connectors, CAT-6 cable with RJ-45 connectors, Power Supply cable with connectors etc.	1	Set		
101	Required total sets of Mains Distribution Units (MDUs), each having inbuilt (in MDU) or external, dual input, single phase, automatic power transfer/static switches (Min 100 Sets (50x2) of (MDUs)) with sequential delayed output on start up, output status LED and IEC-3 pin (for those equipment which have single power supply input) for equipment in racks.	1	Set		
102	Industrial type 3 pin Male-Female connector (Min 100 nos) as per site requirement	1	Set		

103	Earthing system and earth pits (Each Set consists of minimum 34 Nos i.e. i-For HPA racks+DBs=1x3=3 ii-ForMonitoring Rooms+DBs=1x2=2 iii-For Isolation Transformer =1x2+2=4 (One each at Input and outpur Shield +Two earthing for output Neutral) iv-UPS Body earthing+Neutral Earthing =2x2=4 v-Body Earthing Racks and UPS DBs=2 vi-for Body Earthng (AVR+PDPs+SDBs)=2 vii- AVR Neutral for 300+125 KVA = 3 viii-Body earthing for UPS Input Panel=2 ix- Technical Earth for Rack and UPS DBs= 4 x-For Radio Racks =2 xi-Lightening Arrestor=2x3=6 (Earth Resistance of each pit < 1 ohm)*Sample picture is enclosed at DRG No.26.*	1	Set		
104	Installation material and laying of cables protection pipes	1	Job		
105	Providing & installing overhead cable tray with cover as per site requirement for laying of all cables between to Compression room and HPA Hall	1	Job		
106	Set of tools consisting of video connectors crimping tools with suitable die-sets of all used connectors, BNC puller,HD BNC Puller, cable strippers of all use cables, set of screw drivers and spanners, Allen key set, DC powered screw and nut openers, digital multimeter, digital clamp on meter, weller soldering station and other essential tools required to be used during installation.	1	Set		
107	High quality professional RJ 45 crimping tool suitable for CAT-5 and CAT-6 Data Cables.	1	Set		
108	16 Port Digital Intercommunication system with five remote wired rack mounted and three wireless belt pack unit and redundant power supply sytem.	1	Set		
109	Heavy Duty, Anti-skid, Foldable, Corrosion Free Aluminium Ladder (Not telescopic) with Top Tool Metal Plate, Both Side Steps. Total length of Both sides of ladder shall be 20 Ft ±1 ft.	1	Set		
110	Inspection tests and analysis, Installation , testing , system integration and commissioning of all equipment supplied in the instant tender for DR Center .	1	Job		
L	**DOCUMENTATION**				
111	Technical manuals (Hard Copy) for all the equipment supplied	2	Sets		
112	Technical manuals (Softcopy) for all the equipment supplied on DVDs/USBs(with Search facility etc) for the station	2	Sets		
113	All software backups are to be supplied on DVDs/USBs.	2	Sets		
114	Final laminated Technical Block diagram and detailed Line diagrams (in color) of adequate (A1 or bigger) size for all the modules of the final solution in the facility after the completion of the installation. One set shall be mounted on wall and other for record at Station).	2	Sets		
115	The soft editable copy of Final Technical Block diagram and detailed Line diagrams (in color) for all the modules of the final solution after the completion of the installation are to be supplied in a separate USB .	1	Set		