E-Mail

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

File No. 19(2)2020-21E1 (P) TV 15/07/2021

Subject: Draft Specifications for SITC of Up-gradation of Compression Chain, Monitoring and Power Supply System at C-Band DTH Earth Station Pitampura New Delhi.

The Draft specification of the upcoming tender is enclosed herewith to offer comments, if any by prospective bidders/Firms. Please also submit budgetary quote of the item 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**

Specification For: Draft Specifications for SITC of Up-gradation of Compression Chain, Monitoring and Power Supply System at C-Band DTH Earth Station Pitampura, New Delhi.

Specification no: SATD/Compression Chain Upgradation/July 2021 dated 05/07/2021

Due Date to offer Comments: 30.07.2021

Encl.: As above (80 Pages)

Prabhat Kumar Singh
Assistant Engineer
Doordarshan Directorate, Doordarshan

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

SPECIFICATIONS
FOR
SITC OF UPGRADATION OF
COMPRESSION CHAIN, MONITORING AND POWER SUPPLY SYSTEM
AT
C-BAND DTH EARTH STATION PITAMPURA
DELHI

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SPECIFICATIONS FOR SITC OF UPGRADATION OF

COMPRESSION CHAIN, MONITORING AND POWER SUPPLY SYSTEM
AT C-BAND DTH EARTH STATION PITAMPURA
DELHI

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1. Introduction

It is envisaged to upgrade the compression chain, Monitoring and Power Supply System of C-Band DTH Earth Station at Pitampura. It is also envisaged to have provision for HDTV channels in the proposed upgraded 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.

2. Scope of Work

The scope of this project includes Supply, Installation, Testing and Commissioning (SITC) of compression chain including monitoring system for C-Band DTH Platform at Pitampura, Delhi and associated works consisting of Input System, Digital Compression System, Monitoring System and Power Supply System etc. All equipment shall also be capable to take HDTV channel without any limitation or requiring any upgradation by way of hardware and software. Broadly the scope of the project consists of:

Proposed Compression Configuration (Encoders, IP Encapsulater / Mux and NMS)

S. No.	Name of Equipment	Proposed Configuration of Equipment
1	Encoder Chassis	(X+2) SDTV & HDTV
2	IP Encapsulator cum Mux	(1+1) Redundant configuration
3	Network Management System (NMS) of Compression System	(1+1) Redundant Configuration

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

Doordarshan is planning to implement DVB-Subtitling, Audio description, EPG, closed captioning etc services in future. Hence, 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.

2.1.1 Bidder shall supply, install, test and commission (SITC) IRDs in (24+4) configuration for SDTV and HDTV channel.

2.1.2 Bidder shall supply, install, test and commission (SITC) one set of SD/HD-SDI Router which consist of minimum 64 X 64 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.

2.1.3 Bidder shall supply, install, test and commission (SITC) one set 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 compression system.

2.1.4 Bidder shall supply, install, test and commission (SITC) one set 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 32 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 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.

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

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

2.1.7 Bidder shall supply, install, test & commission (SITC) one set of Compression Network Management System (NMS) in (1+1) configuration to control and monitor transport stream. Compression Network Management System (NMS) shall control and monitor all compression equipment (i.e. IRDs, SDI Router, Encoders, Multiplexers, ASI Router, etc) of Compression system.

2.1.8 The bidder shall supply, install, test & commission (SITC) one set of 8 x 8 or better matrix ASI router with dual redundant power supply, X-Y remote panel and single Bus panel.

2.1.9 The bidder shall supply, install, test & commission (SITC) 1 set of 32x32 SD-SDI & HD-SDI/ASI compatible router with dual redundant power supply, X-Y remote panel and single Bus panel.

2.1.10 Bidder shall supply, install, test & commission (SITC) 1 set of confidence level monitoring system.

2.1.11 Bidder shall supply, install, test & commission (SITC) 2 sets of multi-viewer display system (For monitoring of Input source and C band DTH Downlink signal). Each set of Multi Viewer display system shall display minimum 32 SDTV channels including 16 HDTV channels.

2.1.12 Bidder shall supply, install, test & commission (SITC) 2 nos., 55 inches (nominal) (diagonal) new LCD monitor with back-lit LED Based display system for monitoring of input source and C band downlink signal.

2.1.13 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 as per BOM. The suggestive number of equipment racks is approx 6 however may increase as per the solution offered. All the racks are to be provided with minimum two nos. single phase MDUs and one no. single phase automatic power transfer/static switch connected between two sources of power supply routed through physically isolated routes. Please refer drawing no. 7.

2.1.14 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, power supply, control, data, earthing, sensor cables etc) shall be laid on cable tray and routed from top of racks. The colour of Audio/Video cables, IP control & data cable should be different for ease of identification in equipment racks.

2.1.15 The bidder shall provide minimum seven sets of earth pits for this DTH set up. Please refer drawing no 8.

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

2.1.17 Bidder shall supply, install, test & commission (SITC) one no. of Isolation Transformer of 75 KVA (3 Phase delta to Star) including power supply cables between DD LT panel & Isolation Transformer system.

2.1.18 Bidder shall supply, install, test & commission (SITC) one no. of Oil cooled AVR 75 KVA (3 Phase +Neutral) including power supply cables between Isolation Transformer & AVR and AVR & UPS system.

2.1.19 Bidder shall supply, install, test & commission (SITC) Power supply system includes 2x60 KVA UPS operating in (1+1) redundant, parallel load sharing mode with minimum 15 minutes battery back- up for each UPS with internal isolation transformer of min. capacity 60 KVA at the output of each UPS in power supply room.

2.1.20 Bidder shall supply, install, test & commission (SITC) one set of Power Distribution Panels (PDPs) fitted with industrial type suitable MCCBs, MCBs, onload changeover switch in power supply room which caters the load of all equipment. PDPs shall have provision to feed power supply as per line diagram to Isolation Transformer, AVR, existing Uplink Antenna & 2x60 KVA UPS; and output of 2x60 KVA UPS to HPA rack , Antenna Controller in Portacabin & SDBs for compression equipment in Compression room. Please refer drawing no 6.

2.1.21 Bidder shall supply, install, test & commission (SITC) Sub Distribution Boards (SDBs) fitted with industrial type MCCBs & MCBs in compression room which caters the load of all new equipment and one SDB in Portacabin for feeding power supply to existing Upconverters, HPAs, Uplink Antenna and associated system.

2.1.22 Bidder shall supply, install, test & commission (SITC) Power Supply cables between output of UPS PDP to above said SDBs in compression room and also feed power supply to SDB installed in Portacabin.

2.1.23 Bidder shall provide furniture for installation of various monitoring equipment in monitoring and control area matching with existing furniture.

3 Eligibility Criteria

The Bidder shall have to meet the following eligibility criteria:-

3.1 Compression System

3.1.1 Bidder should have a proven track record of carrying out similar compression system projects in the past. The list of such projects successfully completed by the bidder in the preceding past five years should be submitted with the bid.

3.1.2 Bidder should have successfully completed two or more SITC of compression chains/streams in (m + n) redundancy mode (where m ≥1 & n ≥1) for DTH/ Digital Earth Station/ DTT/DVB-C platform in the immediate preceding past five years.

3.1.3 Copies of work order and successful completion certificate of the above two SITC provided at para 3.1.2 to various organizations in the preceding past five year should essentially be submitted along with the bid document.

3.1.4 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 records of OEM of such equipment to various organizations must be provided.

3.1.5 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in the preceding past five years:

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

3.1.6 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in the preceding past two years:

S. No.	Equipment	Qty
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.

3.1.7 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 3.1.5 to various organizations in preceding past five year; and Encoder chassis provided in para 3.1.6 to various organizations in preceding past two year should essentially be submitted along with the bid document.

3.1.8 The cutoff date for the experience shall be the date of NIT.

3.2 Monitoring System

3.2.1 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in immediate preceding past five years:

S. No.	Equipment	Qty
1	Multi-viewer	10 Nos.

3.2.2 Copies of supply order and receipt certificate of above said quantity of Multi Viewer provided in para 3.2.1 to various organizations in preceding past five year should essentially be submitted along with the bid document.

3.2.3 The cutoff date for the experience shall be the date of NIT.

3.3 Power Supply System

3.3.1 OEM of the offered UPS system must have manufactured and supplied atleast 10 Nos of the 60 KVA or higher rating of UPS to the leading broadcaster, IT Industry etc in the preceding past five years.

3.3.2 Copies of supply order and receipt certificate/Challan/Copy of Invoice of above said quantity of UPS provided in para 3.3.1 to various organizations in the preceding past five year should essentially be submitted along with the bid document.

3.4 Bidder not having relevant experience may tie up with other partner/partners having requisite experience as mentioned above. In such case, the partner/partners alongwith the bidder will be responsible for carrying out Design, Fabrication, Supply, Installation, Testing & Commissioning of the offered system. The documents for requisite experience of the partner/partners along with the bidder are to be submitted along with bid. The Memorandum of Understanding (MOU) of partnership to this effect should be submitted

along with the bid. However, this MOU does not absolve the bidder from successful completion of SITC job as per the terms and conditions of the tender.

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

4. Turnkey Implementation and Commissioning:-

a) The complete project will consist of Supply, Installation, Testing and Commissioning (SITC) of one compression chain and their monitoring system; Power Supply system at DTH Earth Station. The project will be carried out on turnkey basis.
b) Each and every offered equipment and accessories including software should be from internationally reputed manufacturer and the quoted model should be high class, high MTBF, field proven and in use by leading broadcasters/ organizations in various continents of the World.
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.

4.1 Input and Base Band System:

4.1.1 Bidder has to lay, integrate and test RF cables with matching RF connector from the existing termination panel of Receive PDA installed in compression room to L band splitter, L band Router to IRD racks (approximately 20m distance). Bidder shall also provide assorted length of RF cables with matching connectors to connect loop-output of IRDs as per site requirement to decode all required channels.

4.2 Compression System:

4.2.1 Bidder shall lay, integrate and test video cables with matching connectors from all IRDs to Input patch panels, 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 Ethernet cables with matching connectors from IRDs to (1+1) IP data switch & network switch and upto the input of all Encoder chassis. 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.
4.2.3 Bidder shall lay, integrate and test video cables with matching connectors from all output port of Multiplexers to Input patch panels, Input Patch Panels to 8x8 SDI/ASI Routers, Output of SDI/ASI Routers to Output Patch Panels.
4.2.4 Bidder shall lay, integrate and test video cables with matching connectors (8 sets) between compression room and HPA Porta Cabin for carrying SDI & ASI signal (Minimum length-30 mtr).

4.2.5 There shall be two fully populated complete chassis of encoder as redundant. 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 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.

4.2.7 For Integration of equipment, Video Cable (75 Ohm, <15 dB/100 ft attenuation at 1.5 GHz), Audio Cable (twisted pair, 110+-20% Ohm) and CAT-6 or better cable for audio/Video data, networking should be used. The colour of Audio/Video cables, IP control & data cable should be different for ease of identification in equipment racks.

4.2.8 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 Monitoring and Measuring system

4.3.1 Bidder shall make provision for monitoring of Input/Source signals received from C - band receive PDA through IRDs i.e. MPEG-2 TS over IP output 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. (Please refer drawing no. 4).

4.3.2 Bidder shall make provision for monitoring of Downlink signals received from C- band receive PDAs need to be routed through chassis consisting of multiple DVB-S & DVB-S2 demodulators with MPEG-2 TS over IP output. Multi-viewer shall have provision to decode SDTV channel from MPEG-2 & MPEG-4 compressed transport stream and HDTV channel from MPEG-4 & HEVC compressed transport stream. 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 drawing no. 4).

4.3.3 Bidder shall supply, install, test & commission (SITC) two sets of multi-viewer display system for monitoring of TV Channels (One set for Input source and other set for Monitoring of C band DTH Downlink signal). Each set of multi-viewer display system shall be provisioned to decode and display 32 SDTV including 16 HDTV channels.

4.3.4 The input source of signal shall be MPEG-2 TS over IP compressed in MPEG-2, MPEG-4 & HEVC format. C band DTH down link signal shall be MPEG-2 TS over IP with MPEG-2, MPEG-4 & HEVC compressed, DVB-S & DVB-S2 standard. (Please refer Drawing # 4 for monitoring setup).

4.3.5 Bidder shall provide 55" LED display system with suitable mounting furniture including video cables to be connected between multi-viewer systems and 55" LED display system.

4.3.6 Bidder shall supply, install, test & commission (SITC) 2 nos. of C- band receive PDA having size 120 cm for receiving the downlink signal for DTH downlink monitoring.

4.3.7 Bidder shall supply install, test & commission (SITC) of one set of Computer Control system for Configuration & Monitoring of Multi-viewer system.

4.3.8 The bidder shall supply, install, test & commission (SITC) 1 set of 32x32 SD-SDI & HD-SDI/ASI routers with redundant power supply with X-Y remote control panel and single Bus control panel(Please refer Drawing # 3) for confidence monitoring setup.

4.3.9 Bidder shall supply, install, test & commission (SITC) 1 set of confidence level monitoring system including IRDs, WFM, 16.5 to 17 inch color monitor, audio/Video Ampli-speaker 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 32x32 SD & HD-SDI Router, WFM, 16.5 to 17 inch colour monitor, 16 Channel Audio/Video Monitor (Video & Audio combined) (Refer DRG No. 1 & 3).
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 32x32 SD & HD-SDI Router, using WFM and 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker (Refer DRG No. 1, 2 & 3).
c. **Encoders Monitoring:** Output of encoder through IP Switch, IRD (with IP input) and 32x32 SD & HD-SDI Router, using WFM and 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker (Refer DRG No. 2 & 3).
d. **Multiplexers monitoring:** Multiplexer output through ASI router and IRD (with ASI input) and 32x32 SD & HD-SDI Router, using WFM & 16.5 to 17 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker) (Refer DRG No. 2 & 3).
e. **Downlink signal monitoring:** Downlink monitoring of the C band DTH downlink signals received via LNA + down converter + RF cable + L band splitter + IRD with CI slot and 32x32 HD-SDI Router, using WFM & 16.5 to 17.5 inch Colour monitor, 16 Channel Audio/Video Monitor with Ampli speaker)(Refer DRG No. 4). However, existing LNA, Down converter, RF cable & L Band splitter shall be used.
f. Temperature and humidity monitoring facility of each equipment rack through remote computer.

4.4 Isolation Transformer, AVR, UPS, Mains Distribution Unit(MDU) and Power Supply system:

4.4.1 Bidder shall supply, install, test & commission (SITC) one no. of Isolation Transformer of 75 KVA (3 Phase delta to Star) including copper power supply cables between DD LT panel & Isolation Transformer system.

4.4.2 Bidder shall supply, install, test & commission (SITC) one no. of Oil cooled AVR 75 KVA (3 Phase + Neutral) including copper power supply cables between (i) Isolation Transformer & AVR, (ii) AVR & PDP and (iii) PDP & UPS System.

4.4.3 Bidder shall supply, install, test & commission (SITC) 2x60 KVA UPS operating in (1+1) redundant, parallel load sharing mode with 15 minutes (minimum) battery back- up for each UPS with internal isolation transformer of min. capacity 60 KVA at the output of each UPS in the power supply room.

4.4.4 Bidder shall supply, install, test & commission (SITC) one set of Power Distribution Panel (PDP) fitted with MCCBs, & MCBs in power supply room which caters the load of all equipment. The output of (1+1) UPS system shall be connected to PDP in power supply room. Please refer Diagram no. 6.

4.4.5 Bidder shall supply, install, test & commission (SITC) the Sub Distribution Boards (SDBs) fitted with MCCBs & MCBs in compression room which caters the load of all equipment. Please refer drawing no. 6.

4.4.6 Bidder shall supply, install, test & commission (SITC) two nos. single phase MDUs (minimum) in each rack for providing redundant power supply to equipment. Please refer drawing no 6.

4.4.7 Bidder shall provide power supply in each rack and terminated on industrial type 3 Pin female connecter to be mounted near each rack and shall be connected to MDUs for further feeding to equipment. Please refer drawing no 6.

4.4.8 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 drawing no. 7.

4.4.9 Bidder shall assess the electrical load of equipment installed in compression 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 Isolation Transformer, AVR, UPS input & Output to PDP, PDP to SDBs, SDBs to equipment racks etc. Please refer Diagram no 6.

4.4.10 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.

4.5 System Requirements:

4.5.1 The bidder must ensure completeness of the envisaged upgradation of C band DTH set up in all respects. The envisaged C band DTH 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.

4.5.2 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.

4.5.3 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.

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

4.5.5 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.

4.5.6 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.

4.5.7 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.

4.5.8 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.

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

4.5.10 Cost of any other work, consultancy and material required for completing the installation & commissioning of the compression, monitoring and Power Supply system should be taken into account and clearly mentioned while submitting the tender.

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

4.5.12 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.

4.5.13 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.

4.5.14 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.

4.5.15 The successful bidder will be solely responsible for commissioning and operationalisation of the compression, monitoring and Power Supply system to the satisfaction of Doordarshan.

4.5.16 System/equipment (Equipment, Panels, Board, 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.

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

4.5.18 The bidder should specify the hardware limitation if any.

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

4.5.20 The layout plan of equipment of Input and Base band system, Compression system and 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.

4.5.21 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.

5 Technical Specification of Major Equipment

5.1 Specification for Input and Base band System

The L band input signal will be received from existing L band terminal of Receive Antenna and it will be routed through L band splitter to L band Router. The input and base band system will consist of:

(a) L band Router
(b) IRD's for SD and HD channels

5.1.1 Specification for 16x16 L Band Router

A. General

(i) L band signal shall be received through RF cable from LNBC of C band receive antenna and connected to L band Router through L band splitter. The output of L band router shall be connected to IRDs.

(ii) Router should have Full fan out (splitting) facility such that it can be configured to route any of the input (16 input) carrying L band signal to any or all of the output (16 no. outputs).

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

(iv) It should have frame controller.

(v) The unit shall be able to provide DC power to LNBCs either through inbuilt Power Supply or Power Supply Unit of the same make as of router.

(vi) Configuration & 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.

B. Specification

S. No.	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	12 dB (min.)
b	Output return loss	12 dB (min.)
4	Input and output RF Connector	Type "F/BNC"
5	Impedance	75 ohm
6	Remote control	RS 232 or RS422/485 or RJ45 or other

5.1.2 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 a front control panel display to enter or edit all the parameters for perfect reception of the signals.
(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 on the front display panel.
(vi) IRD should be able to bulk descrambler of BISS mode 1 and BISS-E signals.
(vii) There should be at least one vacant slot (CI slot) for conditional Access System for descrambling all MPEG-2, H.264/MPEG 4 & H.265/HEVC and DVB-S & DVB S2 services.
(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.
(xi) IRD should be able to generate and save logs for alarms and warning through NMS.
(xii) IRD should have the facility to decode opportunistic data and pass ancillary data like closed captioning, EIA 608/708, DVB-Teletext, DVB- subtitle, DPI SCTE-35 etc.

B. RF Parameter Specifications

Sl.	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	Minimum one no. on BNC

D. Audio and Video Decompression Parameters

Sl.	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 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) Linear PCM (Pass Through) vi) Dolby E (Pass-through)

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

Sl.	Parameters	Specification
1	SD-SDI and HD-SDI O/P Serial Interface	SMPTE 292M-1485 Mbps SMPTE 259M-(10 bit) 270 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.	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) Linear PCM (Pass Through) vi) Dolby E (Pass-through)
2	Load Impedance	110 Ohms
3	Connector Type	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.	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	MPEG-2 TS over IP (MPTS and SPTS) on Ethernet
2	Quantity for IP Input	Minimum two no. RJ 45 if unidirectional; otherwise Two nos. Bi-directional RJ 45 port meant for IP output shall also be acceptable.
B	IP Output	
1	Format	MPEG-2 TS over IP on Ethernet with multiple services filtering facility and decryption including opportunistic data.
2	Quantity for IP Output	Minimum two nos. on RJ 45 if unidirectional; otherwise two nos. Bi-directional RJ 45 port meant for IP Input shall also be acceptable.

I. Size

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

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 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
   d) IP Data Switch
   e) Compression Control system Computer (Hardware and Software) i.e. Network Management System (NMS)
   f) 8 x 8 or better matrix of SDI/ASI Router

ii) The system should have the facility to insert Logo 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, ASI Router etc shall be compatible with IP based interface.

iv) Compression system (either in Encoder or IP Encapsulator cum Multiplexer) should have BISS-1 and BISS-E encryption facility to encrypt all the services with enable & disable facility.

v) 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 the 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 ports.

C) Technical Specification:

Sl	Parameter	Specification
1.	Matrix size	64 x 64 for HD-SDI and SD-SDI port
2.	Input	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	One or more HD-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; 75 ohm , 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) one set 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 16HDTV Encoders with SDI input per stream. "X" no. of these encoder chassis shall also be capable to take atleast 32 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 8 BNC/HD BNC/ Mini DIN 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 8 BNC/ HD BNC / Mini DIN port, the probable combination/configuration of channels to be compressed in each chassis are tabulated below:

No. of BNC/HD BNC /Mini DIN 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
8	8	0	8
8	6	2	8
8	4	4	8

(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
1	16	0	16
2	13	1	14
3	9	2	11
4	6	3	9
5	4	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 the option to auto switch to pre-recorded Image (JPEG, PNG & GIF 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-1770-2 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.

C. Serial Digital Interface (SDI) Input Specifications

Sl.	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/DIN/Mini DIN female, 75 ohm
5	Physical SDI Port enabled	i) Minimum 4 Port ii) Maximum 8 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.	Parameter	Specification
1	Serial interface	a) SMPTE 272M b) SMPTE 299M
2	Format	AES/EBU, 4 stereo channels
3	Connector	BNC/HD BNC/DIN/Mini DIN female, 75 ohm

E. IP Transport Stream Input Specifications

Sl.	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. Video compression parameters

Sl.	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) 1 to 4 Mbit/s for 4:2:0 Profiles of SDTV ii) 3 to 20 Mbit/s for 4:2:0 Profiles of HDTV
4	Temporal Processing	I, B, B, P frames structure to support low delay mode.
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

G. Audio Compression Parameters

Sl.	Parameter	Specification
1	Audio Encoding Method	i) MPEG-1 layer II ii) HE-AAC (MPEG-4) v1 & v2 5.1 Audio iii) Dolby Digital 5.1 AC-3 audio 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 & v2 encoding) iii) 224-640kbit/s (Dolby Digital 5.1 audio encoding) iv) 192-640kbit/s (Dolby Digital Plus 5.1 audio encoding)

H. IP Transport Stream Output Specification

Sl.	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

I. Control and configuration of Encoder chassis

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

J. 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.
- **vii.** CPU of server shall be similar to Intel Xeon Gold series or better and launch date of CPU of server should not be prior to year 2019.
- **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.	Parameter	Specification
A	**Performance of Central Processing Unit**	
1	No. of Core	18 (Min.) per CPU
2	No. of Thread	36 (Min.) per CPU
3	Processor Base Frequency	2.30 GHz or better
4	No. of CPU	Two or more
B	**Memory Specification**	
5	RAM	DDR4, 64 GB or more
6	Storage Memory	SSD, 240 GB (Min.)
C	**Operating System**	
7	Operating system	Linux
D	**Ethernet Network**	
8	No. of Ports	i) Dual 1 Gigabit port for Input or more ii)Dual 1 Gigabit port for Output or more
E	**PCI slot**	
9	PCI slot for SDI	2 nos. or more
F	**Operating Environment**	
10	Operating Temperature	0 to +35 ℃
11	Humidity	>95%

5.2.3 Specification for IP 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 IEEE802.1sMultiple VLAN instances of spanning Tree.
(iv) IEEE 802.1x support for dynamic, port-based security, providing user authentication.
(v) Real-time network fault analysis with easy-to-deploy device specific best-practice templates

B. Specification

Sl.	Parameter	Specification
A	**Performance**	
1	Forwarding rate	72 Mpps (100 MBps)
2	Memory:	
i	DRAM	4 GB (Min)
ii	FLASH	2 GB (Min)

3	Maximum 10/100/1000 Ethernet ports	48 (Min)
4	Switching capacity	176 Gbps(Min)
5	Throughput	72 Mpps(Mega packets per second)
6	IPv6 support	in software
7	Uplink optics type	4 SFP (Min 1GB per SFP port)
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 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 through IP and ASI in CBR and/or VBR mode inputs per transport stream. It should have the facility for statistical Multiplexing, 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 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), four independent ASI input port ; and two independent ASI output port with two mirror ASI output for monitoring, so that IP Encapsulator 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 RJ45 as well as ASI on BNC/HD BNC port.

iv) Each IP Encapsulator shall generate two independent ASI output transport stream for transmission and their two mirror ASI output transport stream for monitoring of the set up.

v) Each IP Encapsulator should be capable to multiplex both SDTV and HDTV signal simultaneously on any output transport stream for transmission and their mirror output transport stream 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) There should be a facility to add more numbers of configurable IP port (minimum two nos. if Bi-directional or four nos. if uni-directional)) and ASI port (minimum 4 Port) for implementation of ancillary services without any up-gradation by way of hardware and software.

viii) 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.

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

x) IP Encapsulator should have DVB compliant for encapsulation of EPG data, DVB-SI/PSI table, NIT table generated by EPG, DVB-SI/PSI Server in the output of transport streams.

xi) Each IP Encapsulator cum Multiplexer unit should have dual redundant SMPS power supply.

B. Specification

Sl.	Parameter	Specification
a)	**IP data Port Specifications**	
1	Type	Gigabit Ethernet 802.3z
2	No of data Ports	Minimum four independent ports (Bi-directional) with licenses (2 ports for Input & 2 ports for output configurable)
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 Multicast (at a time only one).
7	Ethernet Interface	1000 base T
8	Ethernet data Connector	Min. 4 Nos. RJ 45 (If Bi-directional)
9	Ethernet Control and Management connector	Min. 1 no RJ 45 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; Female
c)	**DVB-ASI Transport Stream Output Specifications**	
1	Format	MPEG-2 TS/ DVB-ASI
2	Quantity (No. of o/p Port)	Minimum 4 Nos. (Two Independent output ports for transmission and Two mirror output ports for monitoring).
3	Transport Stream output	100 Mbps per Output Stream
4	Connector	BNC/HD BNC; Female

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 equipment. There shall be no requirement of rebooting of the 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. That is without the use of any additional / external computer hardware or software
e. Fast response to the variations as per the complicacy of the source material.
f. Enabling of statistical Multiplexing shall not need any change in the hardware or software of the receiving equipment i.e. STBs/Decoders.

D. Implementation of DVB- Subtitling, Audio description, DPI, closed captioning etc

Services like DVB-Subtitling, Audio description, EPG, Closed captioning compliant with EIA 608/708, digital program insertion compliant with SCTE35 insertion via SCTE104 triggers etc will be carried by this earth station 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.

5.2.5 Specification for 8x8 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-Switch able 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	8x8 or better matrix
2.	Input	SDI/ASI (BNC 75 ohms)
3.	Equalization	Automatic: 150 Meters of Belden 1694 or equivalent at 270 Mbps.
4.	output	SDI/ASI (BNC 75 ohm)
5.	Return Loss	Should be maintained better than 15 dB on data rate up to 270 Mb/s throughout the switching chain.

5.2.6 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 60 TV channels (min) per mux group. However, there should not be any restriction on total number of output streams.

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, GEF 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 (1+1) rack mounted server for 24x7 operation in master and slave configuration or cluster configuration with three client licenses.
ix. There shall be three client PCs with required licenses and 21 inch or better size display monitors along with each PC for monitoring of NMS system from remote locations.
x. These client PCs shall be installed in the Monitoring room, shift in-charge room and HPA Portacabin room. HPA Portacabin room is located 30 meters away(approx.). An Ethernet connection required to be provided on the client PC for monitoring in HPA Portacabin room.
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 modem over standard dial-up telephone lines or 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 is to be loaded on a single control computer with networking facilities.

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.	**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 licensees.

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 dial up telephone line/ 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.

5.2.7 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.

B. Technical Specification

S.NO.	Description	Specs
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 Monitoring System

The monitoring system has two parts:

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

A confidence level monitoring system consists IRDs with L-Band inputs, IRD with ASI input, IRD's with IP input, 32x32 SDI Router, Waveform monitor,17"(Nominal) colour monitor and 16 Channel Audio Video Monitor etc.

The input monitoring system of TV channel consists of IRDs with MPEG-2 TS over IP output, 32 Channel Multi Image Display System. The downlink monitoring system of TV channel consists of DVB-S & DVB-S2 demodulator, channel decoder, 32 channel multi image display system.

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

5.3.1 Confidence Level monitoring system

5.3.1.1 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.	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)

5.3.1.2 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 32x32 SD/SDI router will be fed to 16 Channel Audio/Video monitor Refer diagram-3.

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

iii) It should decode and display upto 16 channel multi format audio 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.

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

v) 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	Video input format	a) SMPTE 259 M SD-SDI with embedded audio b) SMPTE 292 M HD-SDI with embedded audio
2	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 i) One Stereo AES/EBU
3	Video input quantity & type	2 nos., SD & HD-SDI input
4	Connector type	BNC, female
5	Audio input format	16 channel/ 8 stereo digital AES / EBU
6	AES and SDI termination	75 ohm unbalance
7	Level meter scaling	AES/EBU, VU
8	Level meter Parameter	Threshold, Reference, limits
9	Loudspeaker Power	12 W per speaker
10	Display Screen type & size	LCD , min 4 inch (diagonal)

5.3.1.3 Specification for MPEG Decoder or IRD with ASI & IP input for SDTV & HDTV

This IRD shall be provided with DVB-ASI & IP input card having MPEG-2 & H.264/ MPEG-4 for SD-SDI with embedded audio, H.264/MPEG-4 & H.265/HEVC for HD-SDI with embedded audio and Dolby Digital 5.1 & Dolby Digital plus 5.1 audio decoder. The specification remains the same as given in the para 5.1.2, except the fact that RF Specification parameter specification 5.1.2(A)(i), 5.1.2(A)(v), 5.1.2(B) & 5.1.2(G) are not applicable.

5.3.1.4 Specification for 32x32 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 32 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 32 input shall be capable of being switched to any or all of 32 outputs.

C. Technical Specification:

Sl. No.	Parameter	Specification
1.	Matrix size	32x32
2.	Input	32 nos. HD-SDI/ASI (BNC/HD BNC 75 ohms)
3.	Equalization	Automatic: 150 Meters of Belden 1694 or equivalent 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.

5.3.2 Input Source and Downlink monitoring system

a. The input source monitoring of all the 32 SDTV channels including 16 HDTV channels of the transport stream will be done on Multi-image display system. All input signal will be available in MPEG-2, MPEG-4 & HEVC compressed MPEG-2 TS over IP transport stream format on RJ45.

b. The downlink signal monitoring of all the 32 SDTV channels including 16 HDTV channels of the transport stream will be done on Multi-image display system. The downlink signal will be required to demodulate and decode all services (32 SDTV channels including 16 HDTV channels and audio) from transport streams. The transport streams will be available in MPEG-2, MPEG-4 & HEVC compressed MPEG-2 TS over IP format on RJ45.

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

5.3.2.1 Specification for Professional Broadcast Quality Multi Image display system for TV Channel

A. Features of multi-image display system:

a) The Multi-viewer system is meant for monitoring the input sources and C Band DTH downlink signals.
b) Each set of offered product shall be of professional broadcast quality & is able to display up to 32 or more videos simultaneously along with the corresponding audio bar graph keyed into the video.
c) Two sets of complete monitoring systems are required to be provided. One set monitoring system shall be configured for monitoring of input sources (32 SDTV including 16 HDTV in each set) and another set of monitoring system for C Band downlink signals (32 SDTV including 16 HDTV in each set) available in IP format of the transport stream compressed in MPEG-2, MPEG-4 & HEVC format. (Please see DRG: 4).
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 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 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) The bidder shall enclose the user list of the broadcasters to whom this product has been supplied.

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

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

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

q) The offered solution shall be modular and expandable.

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

s) The system shall log actions taken in a secured file.

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

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

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

B) **Multi Viewer Image Display System Processor and Audio Video Decoder**

Sl.	Parameter	Specification
1	Format of Input Transport Stream	MPEG 2 TS over IP (SPTS & MPTS)
2	SD-SDI Video Decoder	i) SD MPEG-2 ii) SD H.264/MPEG-4 AVC
3	SD-SDI Video Resolution	720 x 576 704 x 576 544 x 576
4	HD-SDI Video Decoder	i) HD H.264 Main Profile Level 4.0 8 bit ii) HD H.264 High Profile Level 4.0 iii) HD H.265/HEVC Main 10 Profile Level 4.0 10 bit
5	HD-SDI Video Resolution	1920 x 1080

6	Audio Decoder	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
7	Video Output Format	SDI/DVI / XVGA/HDMI
8	Video Output Port	Min 2 nos. (Independent)
9	DVI Input Port	Min 1 No.
10	Operating Temperature	5 to 35 degree Centigrade
11	Humidity	8 – 90%

5.3.2.2 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:-

S. 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	1.0 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-S-2 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	1.0 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

5.3.2.3 Specifications for Professional Broadcast 55" LCD Video wall Display

S. No	Parameter	Specifications
1	Size	55 inch 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	1400:1
10	Bezel Size	Maximum 4.0 mm/4.0mm Bottom/Right) Maximum 4.0mm/4.0mm (Top/Left)
11	Power consumption	400W Max
12	Mounting	Wall and stand Mounting
13	Accessory	Power cord, DVI / HDMI Cable

5.4 Measuring Equipment

5.4.1 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 & Vectorscope, Picture display, eye pattern diagram, SDI format analyzer, SDI jitter application 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 % (0.5 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

5.5 Power Supply System

The Power Supply System consists of the following equipment:-

a. 75 KVA 3 Phase Isolation Transformer
b. 75 KVA Oil Cooled Automatic Voltage Regulator (AVR)

c. 2x60 KVA UPS operating in (1+1)parallel redundant load sharing mode with 15 minutes battery backup for each UPS
d. Power Distribution Panels (PDPs) and Sub distribution Boards(SDBs) for power distribution to the various equipment chains.
e. Suitable earthing for the power supply system.

5.5.1 Specification for 75 KVA air-cooled Isolation Transformer (To be used externally at input of AVR/UPS)

The Isolation Transformer should be Three Phase, naturally air-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 V (phase to neutral)
3.	Frequency:	47 to 53 Hz
4.	Capacity:	75 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.	Input & Output Terminals	Studs on fiber glass plate

5.5.2 Specification for oil cooled Automatic Voltage Regulator (AVR)

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	75 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 (iv) 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

5.5.3 Specifications for UPS system including Battery

Bidder will have to supply, install, test and commission the 2x60 KVA UPS including Battery System for Earth Station.

A. General Features of UPS:

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 UPS system shall be capable of running in single stand-alone Mode as well as in Parallel Redundant Load Sharing Mode with another identical UPS as per the attached configurations shown in Fig. 5A & Fig. 5B respectively.

1	a) The UPS 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	The UPS should offer low input current harmonics distortion (THDI), good regulation, excellent transient response and high stability.
4	a) The UPS system should have a monitoring panel (LCD Based) with various types of fault alarms and metering functions including: (i) Output voltage, current & frequency. (ii) Input voltage, current & frequency. (iii) Bypass Voltage, Current & frequency. (iv) Battery capacity, backup time left & bad battery indication. (v) 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.
5	a) The UPS system should have wide input voltage and input frequency tolerance as specified in Rectifier section. b) Transient Voltage Surge Suppressor (TVSS) should be provided at the input & output of the UPS System.
6	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.
7	UPS should be configured for parallel redundant operation. In case of failure of parallel operation, automatic and manual override for the system to work in 1+1 hot standby should be available as per suggestive single line diagram 5A & 5B.

8	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.
9	a) The system should have provision for protection against i. Input under voltage ii. Input Over Voltage iii. Output Over Voltage iv. Output Over load v. Output short circuit vi. Battery under Voltage vii. Over temperature viii. DC Over current b) The system should generate aural and visual alarms for above-mentioned conditions.
10	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
11	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.
12	(a) Bidder should specify the nos. & type of desired batteries, which shall be part of the system to be offered. The maintenance free-batteries VRLA type shall only be acceptable. The detailed technical specification of batteries with their working life is also to be specified and provided with the offer. (b) The firm should also provide battery changeover unit for battery banks so that any bank can be connected to any UPS system.
13	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.

14	The UPS 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.
15	The UPS system should be designed with forced air-cooling for proper ventilation. Acoustic noise level should be kept at minimum.
16	The UPS system output should be isolated from the DC circuit of the UPS.
17	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"
18	The UPS manufacturer must be ISO 9001-2000 certified company. A copy of the certificate should be enclosed with the offer.

B. Operation Features and Technology of UPS

1. Technology:

The 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) Normal Operation:

UPS inverter should continuously supply the critical AC load. The rectifier & charger should take power from the AC input source, convert it to suitable DC and supply to inverter as well as charger the Batteries on Automatic Float cum Boost Mode.

b) UPS Mains Failure:

Upon failure of AC input power, the critical AC load should continue to be supplied by the inverter, which should obtain power from the battery bank. There shall be no interruption in power to the critical load upon failure or restoration of AC input source (Mains/DG).

c) 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.

d) Static Bypass:

Each UPS Module should have in-built 100% rated static Bypass Line. In two UPS Modules connected in Parallel redundant Current Sharing Mode, in the event of any fault in one UPS, the faulty UPS should isolate itself and the healthy UPS, which normally shares the load 50%, should take-over the full load.

	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.	MTBF of the System	Minimum 150000 Hrs.
3.	Capacity:	60 KVA at power factor 0.9(54 KW)
4.	Overall Efficiency (From I/P to O/P of the UPS System)	>93% (for all loads from 50% to 100%)

2. Features of Rectifier Section of UPS

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	47 - 53 Hz
5.	Input Power factor	> 0.99
6.	Input Current Harmonic Distortion (THDi)	$\leq$ 3%
6.	Soft start (0-100%)	10 Sec minimum
8.	DC ripple voltage	< 1%

3. Features of Inverter of UPS:

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.
4.	Output frequency regulation (b) Line Connection: a) Self Connection:	 ± 1% (meeting input frequency range of 47-53 Hz.) ± 0.05% or better
5.	Output voltage Distortion: (at rated load)	< 1% linear load, < 3% non-linear load with 3:1 **crest factor**
6.	Audible noise level at 1 meter	74dBA maximum
7.	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
8.	Computer Interface:	RS 232 Interface or Ethernet
9.	**Note: Bidder should Specify the following Parameters for quoted UPS system** i) Total system losses at nominal load (with charged battery) ii) Size of LCD panel for monitoring should be 50 x 100 mm minimum	

4. Battery bank and Battery of UPS System

The bidder should submit battery sizing calculation from UPS/Battery OEM justifying following points:

- No. of Cells
- Capacity of Cell (Ah), (By considering the K factor, efficiency of system, Temperature correction factor, Ageing correction factor, etc.)
- DC bus voltage
- The minimum required area for battery installation should also be mentioned.

S. No	Parameter	Specification
1.	Battery Bank Capacity	Minimum 50000VAH (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:	12V Maintenance Free Valve Regulated Lead Acid (VRLA) type.
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^{o}C
7.	Cutoff Voltage	1.70-1.75 V per Cell (should be Selectable)
8.	Floating Voltage regulation between no load & full load.	2% 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	4 years designed life at 27^{0} C on full float.
12.	Life Cycling Characteristics	Each battery shall be designed to provide 1300 cycles at 30% depth of discharge (DOD) at 27^{0} C and 600 cycles at 50% DOD at 27^{0} C.
13.	Recharge Rate	The battery shall be capable of a 90% recharge within 12 hours
14.	Operating Temperature	The battery shall be capable of operating in temperature ranging from 0^{0} C t0 +40^{0} C.
15.	Gassing	No Special ventilation shall be required under normal operating conditions. No specialized "battery room" shall be required to house the battery unit.
16.	Battery Orientation	Battery shall have front or top accessible terminals with clear removable covers to facilitate visual inspections and allow ease of service.

17.	Self-Discharge	The battery shall have a maximum self-discharge rate of 0.5-1.0% per week at 27°C.
18.	Housing of Battery	The battery system should be installed & supplied with M S racks (Stand)
19.	Capacity Testing	Each battery shall be capacity tested at the manufacturing facility as per standard battery testing procedure. For each battery, battery performance tables and curves shall be submitted with the supply. The curve may be obtained by test or by calculation.
20.	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. Assembly and connection drawings. 3. Each module shall include an easily removable transparent "snap on" safety shield to cover all connectors
21.	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.

5.5.4 Specification for Power Distribution Panel

Suitable Power Distribution Panel (PDP) must be supplied and installed which will distribute the AC power to each SDBs of the Earth station. The suggestive block schematic is given for general idea about the configuration of PDPs (Please refer Diagram no. 6). Bidder shall submit schematic diagram in advance before installation for approval.

5.5.5 Specification for Sub Distribution Board

Suitable Sub Distribution Board (SDB) must be supplied and installed which will distribute the AC power to each rack of the compression and Monitoring system. The suggestive block schematic is given for general idea about the configuration of SDBs (Please refer DRG no. 6). Bidder shall submit schematic diagram in advance before installation for approval.

5.5.6 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. 8)

b. All earth pits shall be extended upto existing earth terminals with insulated copper strip (75 Sq.mm (Min)) in their respective equipment room i.e. Compression room. All equipment rack shall be directly connected to Earth Terminals with insulated multi strand copper wire (25 sq mm (Min)) with copper lugs at both ends.

5.5.7 Specification of MDU

i) Every rack should have minimum one set of single phase auto change over switch along with two Mains Distribution units (MDUs). 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: 6).

ii) All Equipment which have dual power supply unit shall be connected directly from MDUs. (Please refer DRG No: 6).

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

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-I.** 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 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

7.1 Power Supply :

Equipment shall operate from a wide range of power supply voltages without interruption or damage.

7.2 Environmental Specifications (wherever not mentioned)

Sl.	Parameter	Specification
1	Operating Temperature (Indoor)	5°C to 35°C
2	Operating Temperature (Outdoor)	-10°C to 50°C
3	Storage Temperature	-10°C to 60°C
4	Humidity (Indoor)	8 to 90% non-condensing
5	Humidity (Outdoor)	0 to 95 %
6	Altitude	2 to 1000 m

7.3 Mechanical Specifications

Sl.	Parameter	Specification
1	Construction	Modular approach, EIA RS-310C, 19" rack mount
2	Cooling	Internal circulation fan wherever applicable
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.	L Band Router
2.	Integrated Receiver Decoders (IRDs)
B	**Digital Compression System**
1.	64x64 SDI Router
2.	Encoder
3.	IP Switch
4.	IP Encapsulator cum Multiplexer
5.	ASI Router
6.	Network Management System (NMS)
7.	NTP Server
C	**Monitoring system**
1.	Demodulator
2.	Multi viewer

3.	32x32 SDI Router
4.	17 inch (nominal) TFT Monitor
5.	16 Channel Audio/Video Monitor
D	**Measuring Equipment**
1.	Waveform Monitor (WFM)
E	**Power Supply System**
1.	Isolation Transformer
2.	AVR
3.	UPS system including Battery Bank

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.**

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 USB 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 USBs.

e) The successful bidder must ensure that all Invoices bear serial numbers of equipment to meet the requirement of WPC.

8.3 Guarantee/Warranty and After Sales Support:

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 period is to be extended corresponding to the outage period if the failure rectification takes more than 15 days time.

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***.

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***.

8.4 Inspection and Commissioning:

a) 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 manufacturers 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.

b) 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).

c) 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.

d) 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.

e) The SITC certificate will be issued by the team of Officers appointed at S.N. **8.4(b)** above.

8.5 Delivery Period:

Five months from the date of issue of purchase order (A/T) by Doordarshan to the successful bidder.

8.6 Pre-Bid Conference:

a) 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.

b) 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.

c) Amendments subsequent to the pre bid conference shall be sent to prospective bidders, who have purchased tender document by e-mail/fax/post/uploaded on website.

d) It shall be bidder's responsibility to check for any amendments/addendum on the 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 **(Annexure V)**.

a) Whether documents related to fulfilment of the eligibility criteria as per Clause 3 have been submitted.

b) Whether the BOM has been submitted in the prescribed format as given in Clause 6.

c) Ensure that all equipment and accessories as given in Annexure-1 have been included in the offered BOM.

d) Whether the compliance statement from the bidder as required in Clause 8.1 (a) has been submitted.

e) Whether the compliance statements from the respective OEMs for equipment/system mentioned in Clause 8.1 (b) have been included.

f) Whether the Authorization 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.

g) 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.

h) 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.

i) Whether the requisite undertakings for guarantee/warranty and after sales support by OEMs as required vide Clause no. 8.3 have been submitted.

j) Ensure that no alternate item has been offered.

k) Ensure that the Un-priced BOM has been included.

l) Any other item mentioned elsewhere in the tender.

Annexure II

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…….
Name of the OEM - ……..
Stamp

Annexure III

OEM LETTER HEAD

CERTIFICATE FOR GUARANTEE

Date:

Tender No. :

We, M/s **……..……** (Name and address of the OEM), do hereby confirm that:

1. All the offered equipment shall be guaranteed against any defect for a period of **5 (FIVE)** years from the date of Commissioning.

2. 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.

3. 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.

4. Guarantee period may be extended corresponding to the outage period if the failure rectification takes more than 15 days' time.

5. 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……..

Name of the Bidder - ……

Stamp

Annexure IV

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	After sales & support office address	Telephone/ Fax	Email of concerned personnel
1				

Signature …….
Name & Designation of authorized signatory……..
Name of the OEM - ……
Stamp

Annexure V

BIDDER LETTER HEAD

DECLARATION BY THE BIDDER

1. Bill of Material (BOM)- : [Yes/No]
2. Bidder's compliance (As per specs clause no. 8.1.1) : [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) (if any) of partnership (as per clause no. 3.4) : [Yes/No]

5. OEM Compliance for following equipment from their respective OEMs (as per clause no. 8.1.2):

S. No.	Name of equipment	Name of OEM	OEM compliance submitted (Yes/ No)
i			
ii			

6. 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.			
.			
.			

7. 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.			
.			
.			
.			

8. 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.			
.			
.			
.			

9. Datasheet for the offered equipment as per offered BOM: [Yes/No]

i.

ii.

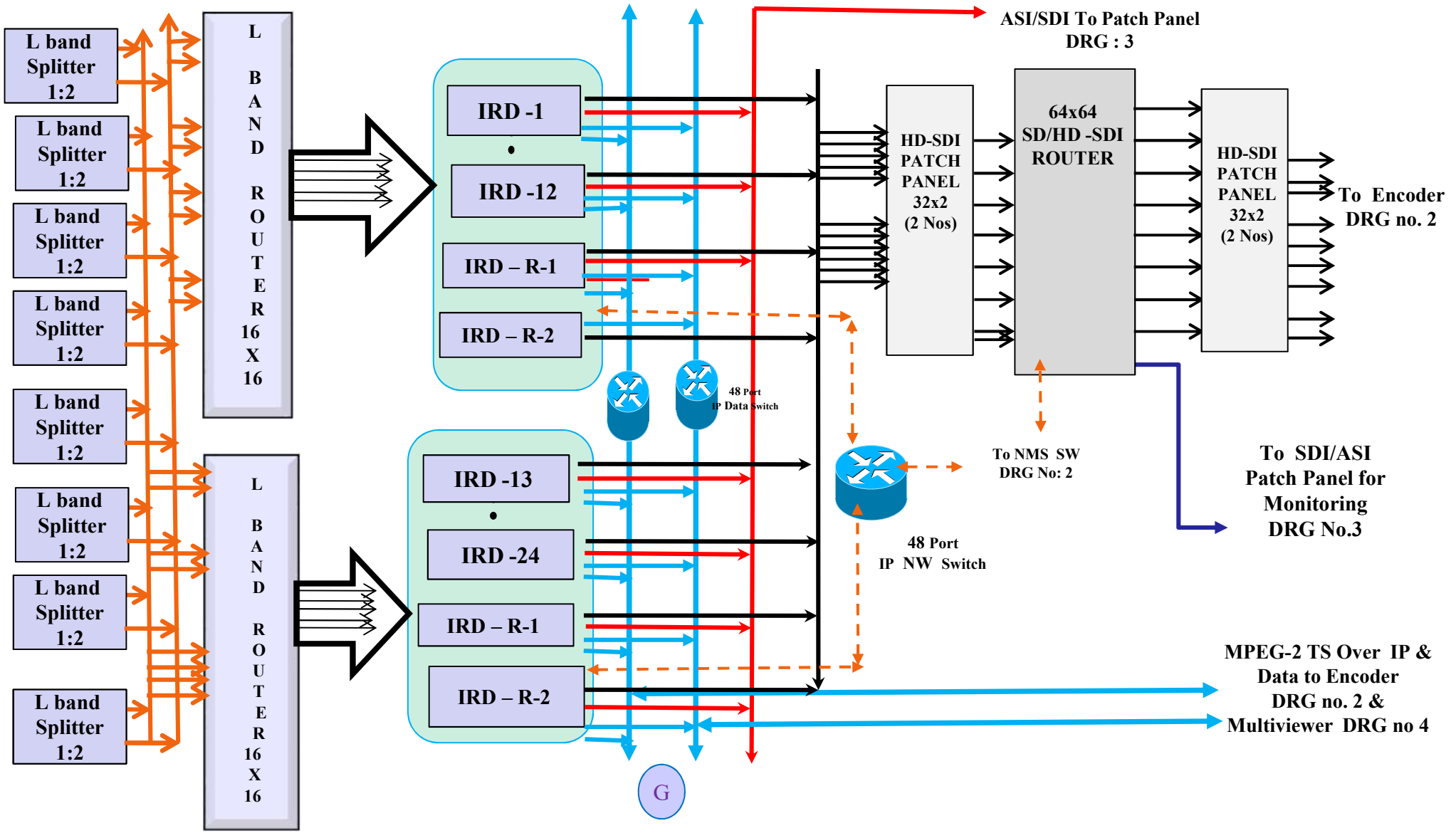
iii.

Signature …….
Name & Designation of authorized signatory……..
Name of the Bidder - ……
Stamp

268439/2021/Sat. Design Section - DG DD

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura - (Input Base Band)

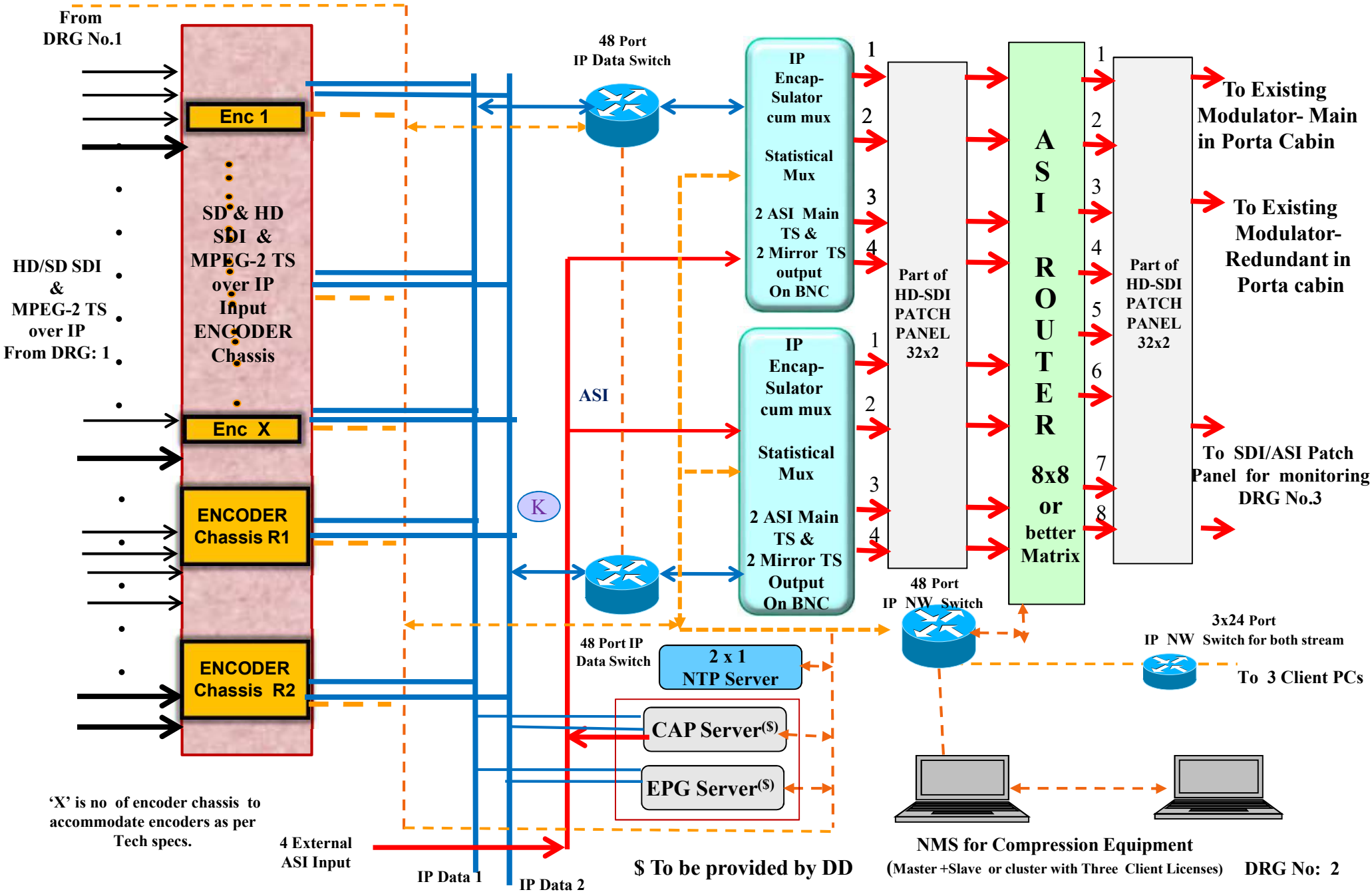
Annexure-VI



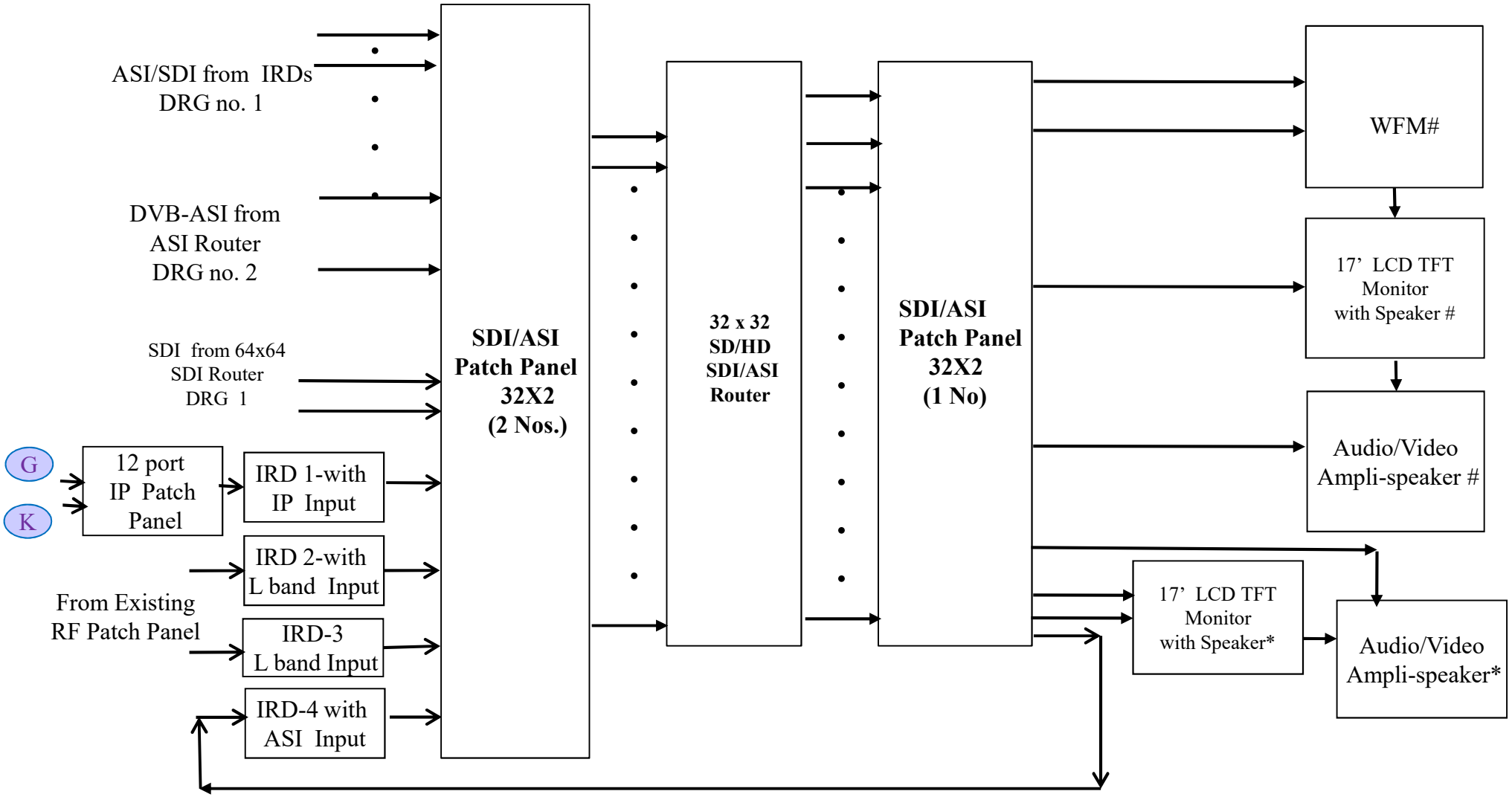
DRG No: 1

268439/2021/Sat. Design Section - DG DD

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura – Compression Equipment



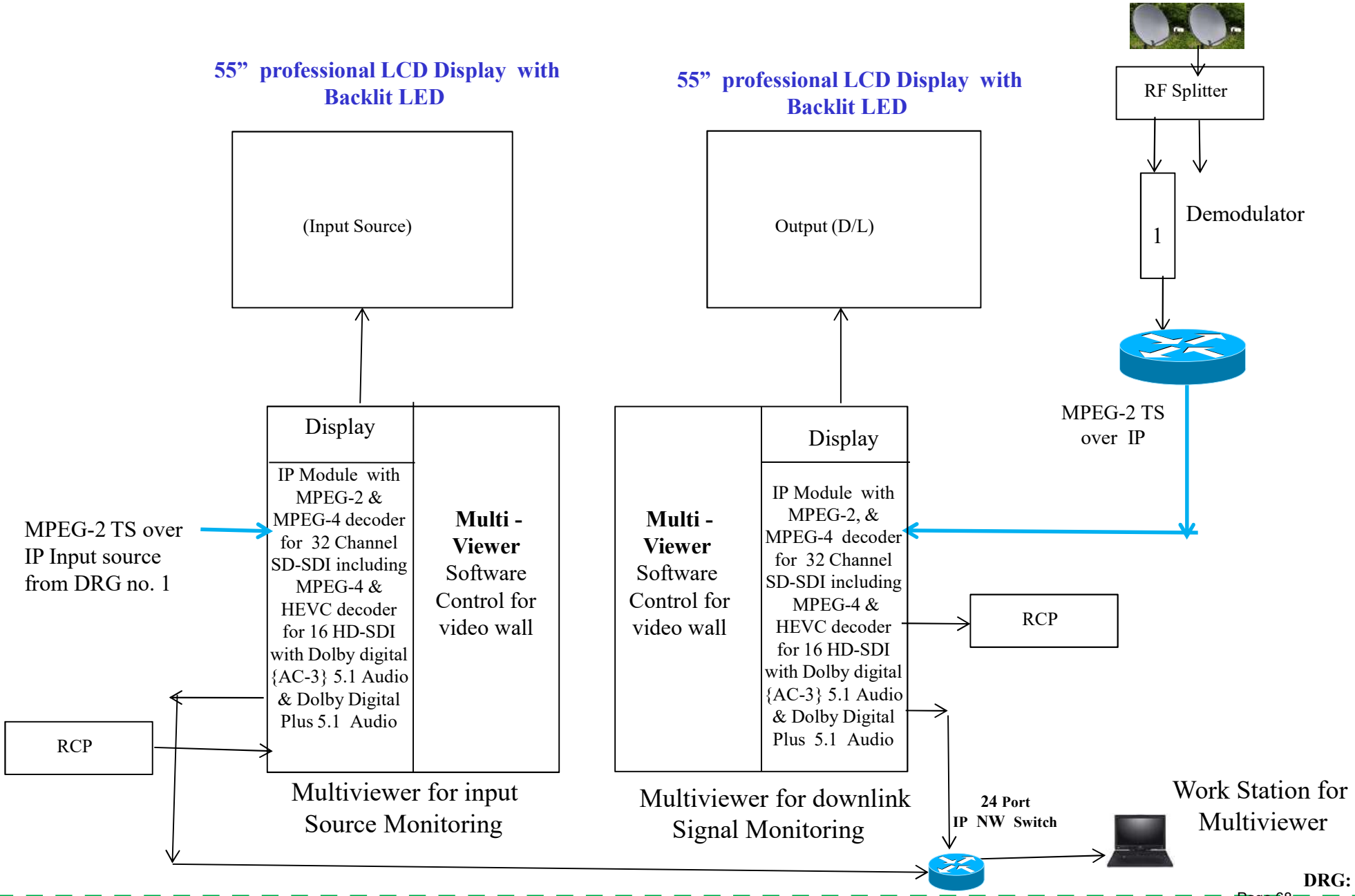
Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura - Confidence Level Monitoring Setup



*To be mounted in Portacabin/HPA Room
To be mounted in Compression Room

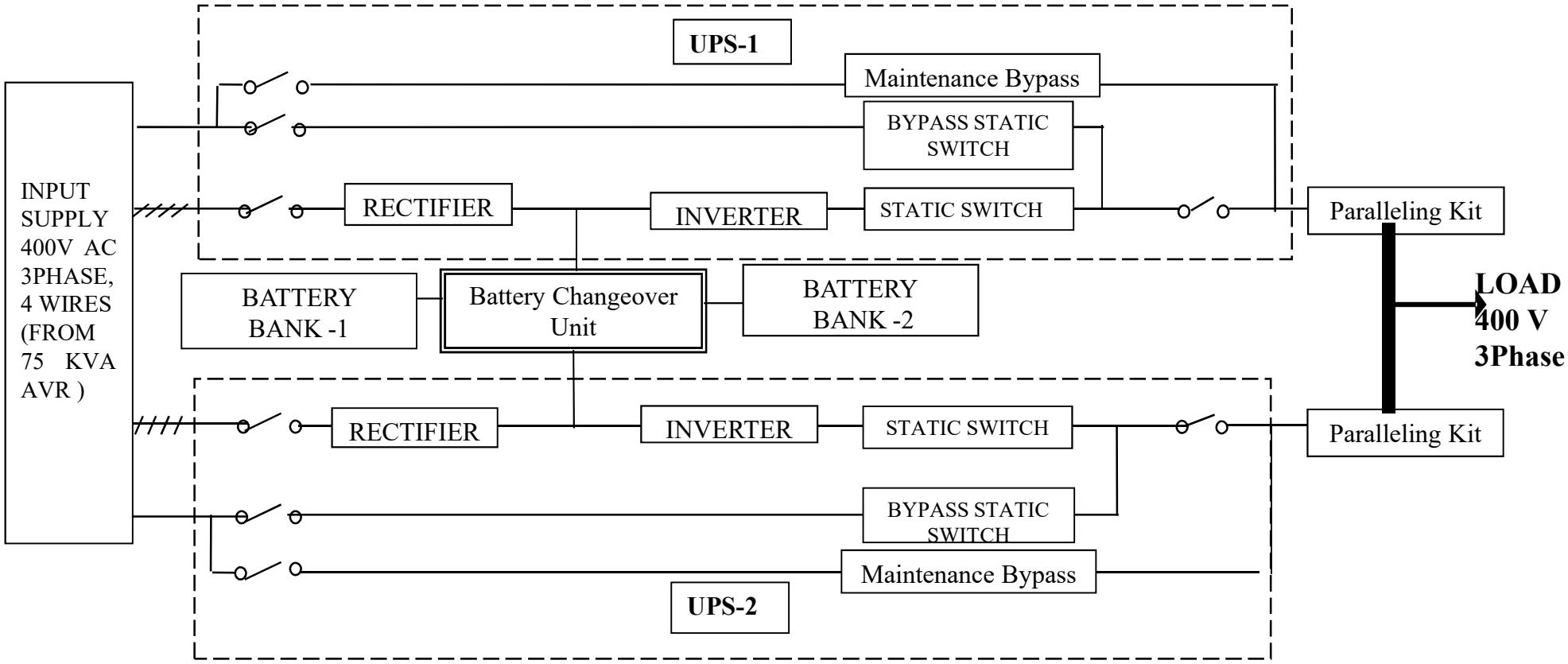
DRG: 3

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura - Monitoring System



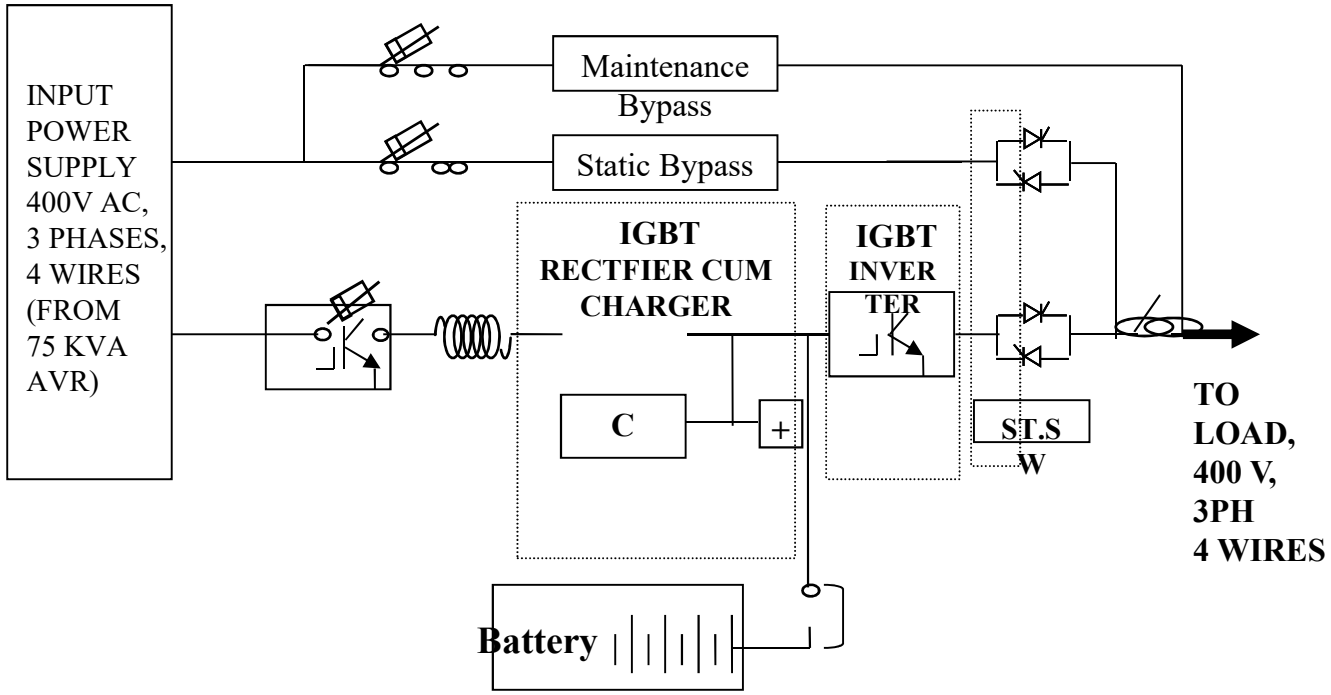
DRG: 4

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura-Single Line Diagram of Parallel Redundant 2x60 KVA UPS



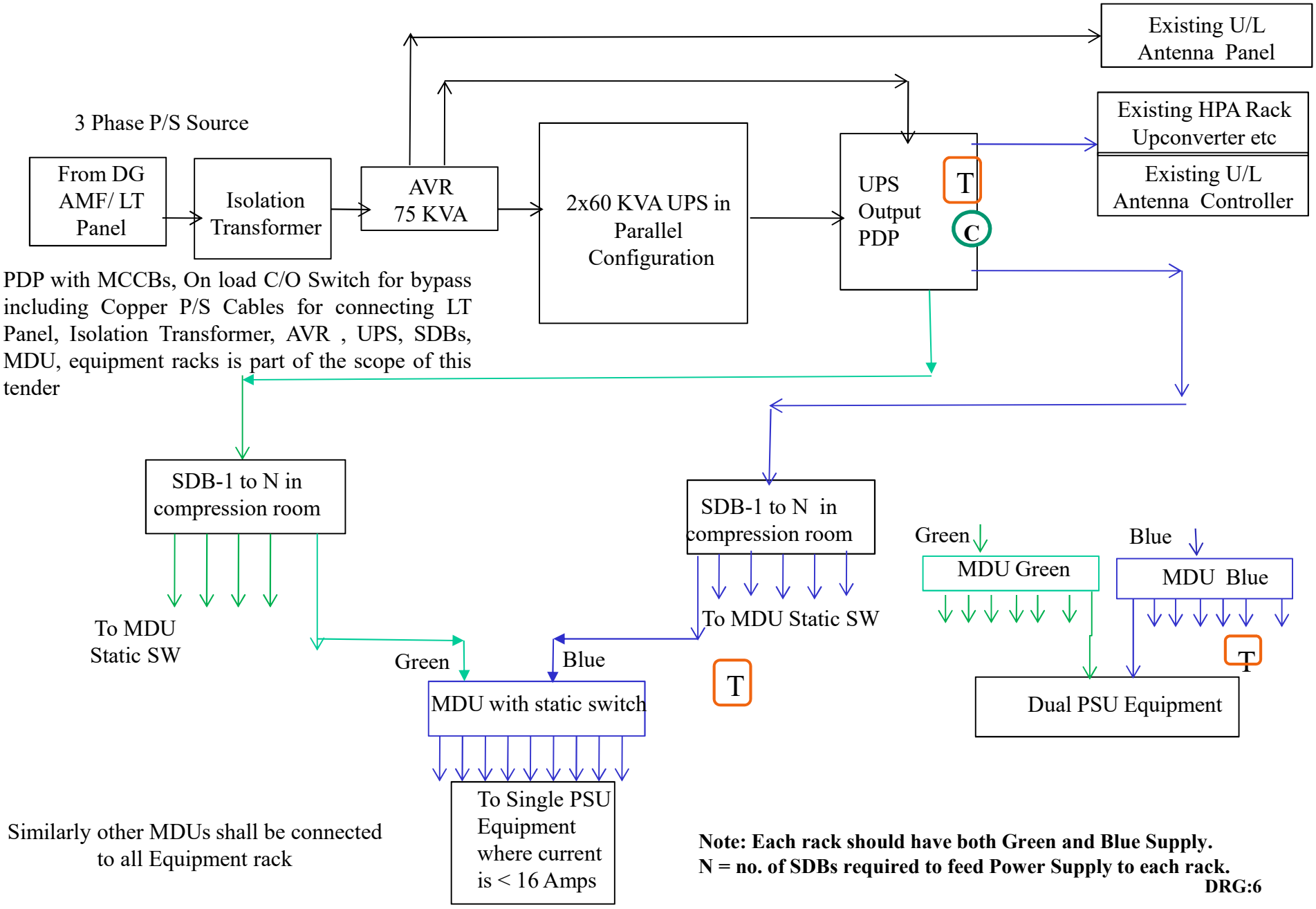
DRG -5A

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura- 2x 60 KVA UPS SINGLE MODULE -SUGGESTIVE CONFIGURATION



DRG: 5B

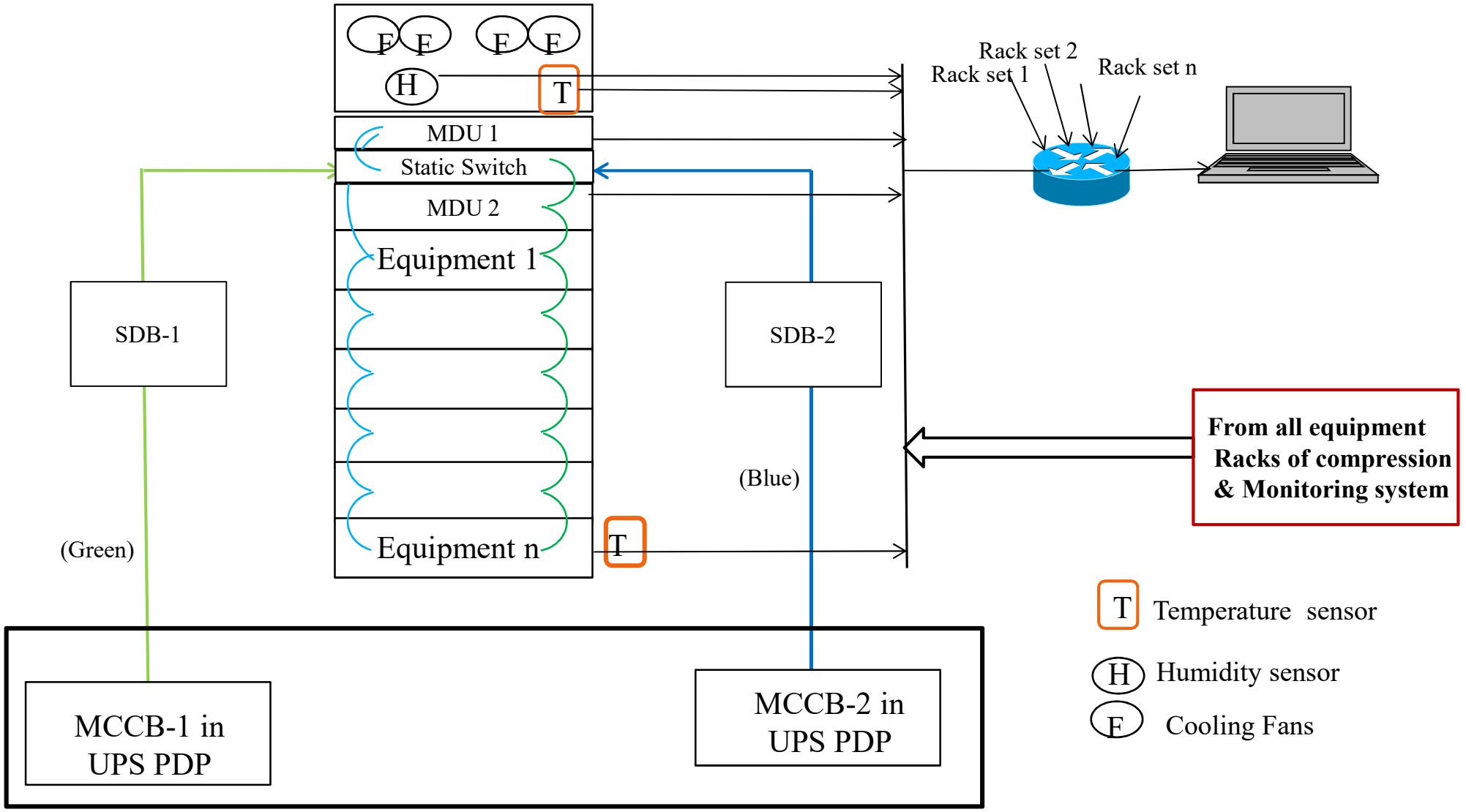
Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura- – Power Supply System



Note: Each rack should have both Green and Blue Supply.
N = no. of SDBs required to feed Power Supply to each rack.

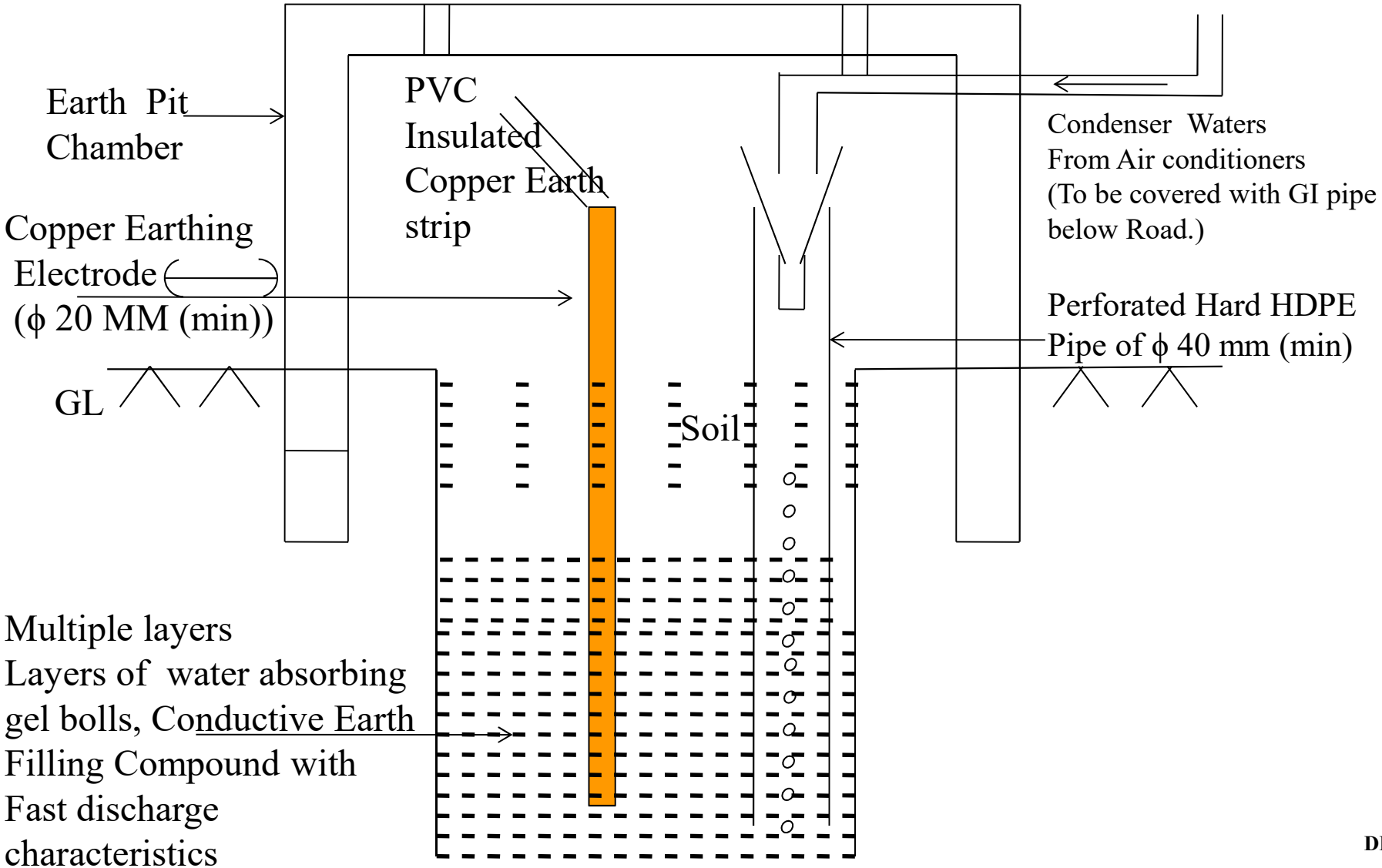
DRG:6

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura - Power Distribution, Temp & Humidity Monitoring in Racks



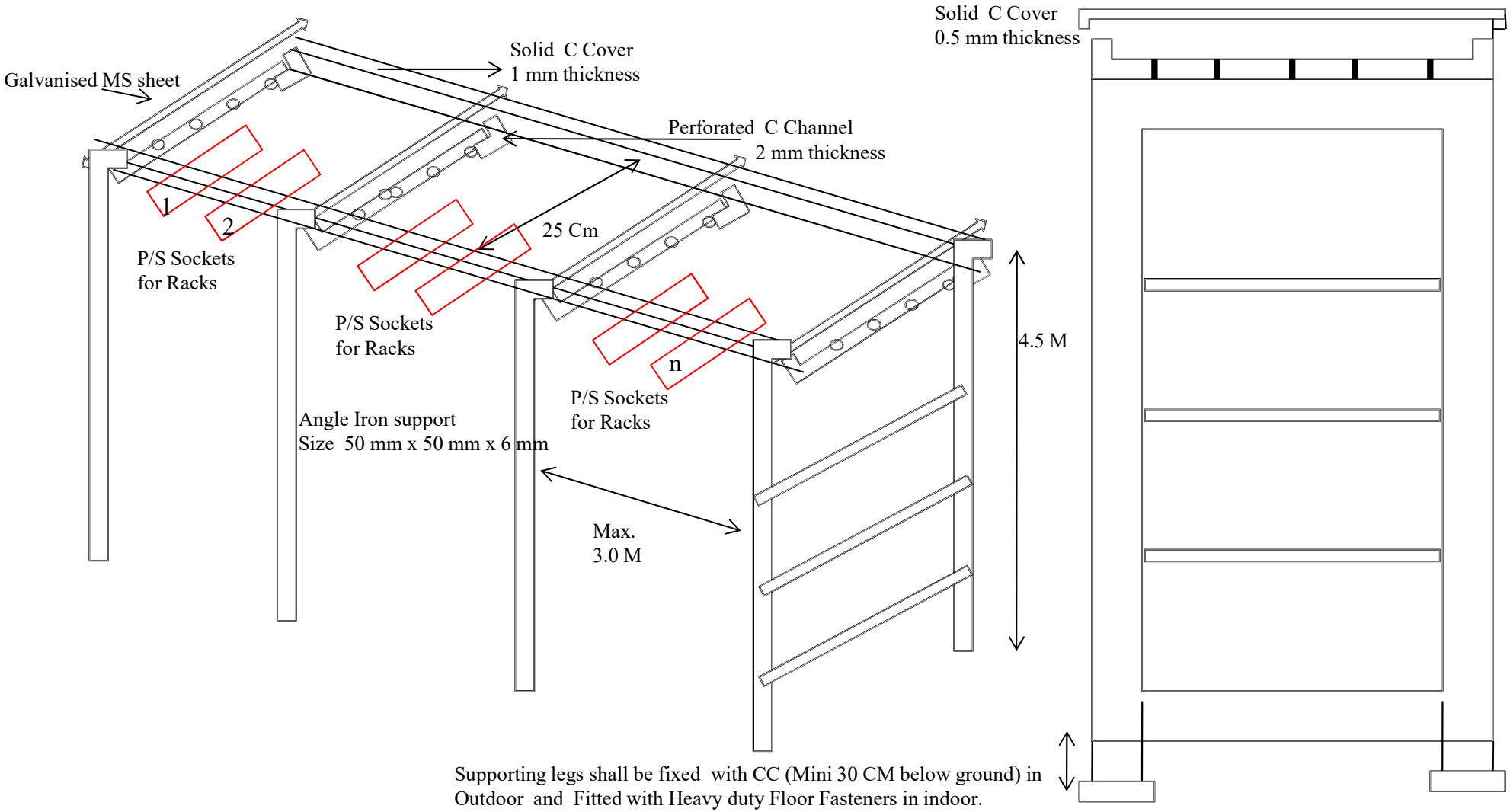
DRG:7

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura - Earth Pit



DRG:8

Suggestive Block Schematic for SITC of Upgradation of Compression, Monitoring and Power Supply System at Earth Station Pitampura – Cable Support System



Supporting legs shall be fixed with CC (Mini 30 CM below ground) in Outdoor and Fitted with Heavy duty Floor Fasteners in indoor.

DRG:9

Annexure-I

Suggestive Bill of Material (BOM) for SITC of Upgradation of Compression Chain, Monitoring and Power Supply System of C band DTH at Pitampura

Sl. No	Description of Item as per Specification (Suggestive BOM)	Quantatiy as per suggestive BOM		Budgetory cost in Rs.
		Total Qty	Unit	
A	**INPUT AND BASE BAND SYSTEM**			
1	**L band Router (16x16) with dual redundant power supply consisting of :**			
a	Base unit fully wired including Cross Point module for 16x16 and control logic Module	2	Set	
b	Hot swappable Dual Redundant Power supply unit	2	Set	
c	X-Y Remote control panel with cable or Inbuilt Router control panel	2	Set	
d	Necessary power supply to LNBCs (one set with each Router)	2	Set	
e	Low loss RF cable and matching "F/BNC" type connector with Gold plated pin as per site requirement (i) Min. 10 meters of each length from existing RF patch pannel to new Patch Panel (mini 10 nos) i.e. 10x10=100 mtr. minimum and new Patch Panel to 2:1 splitter i.e. 3 mtr x 10=30 mtr mini) (ii) 5 meters per signal i.e. 5 x16x2=160 mtrs (min.) to be connected from L band splitter to L band routers as per DRG No. 1 and all balance 8 Input ports of both L band Routers	1	lot	
f	RF Patch panel for all input port of L band Router *(with matching "F/BNC" type connector with Gold plated pin of Canare or equivalent)*	1	set	
g	1:2 L Band splitter with DC pass through	10	sets	
h	Installation, testing and integration of L Band Router and associated equipment/ accessories	1	job	
2	**Professional IRDs consisting of:**			
a	Professional IRDs with L-band inputs of DVB-S & DVB-S2, DVB-ASI & IP Input compliance decoder 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).	28	Nos	
b	Low loss RF cable and matching "F" type connector with Gold plated pin as per site requirement (5 meters per signal i.e. 5 x 28= 140 mtrs (min.) to be connected from L Band Router to IRDs as per DRG No. 1.	1	lot	
c	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 1) between the HD SDI output port of all IRDs to HD-SDI Patch Panel (Min 10 mtr x28 Nos=280 mtr)	1	lot	
d	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 1 & 3) between the ASI output port of all IRDs to HD-SDI Patch Panel for Monitoring (Min 10 mtr x28 Nos=280 mtr)	1	lot	

3	**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. (2 Nos. per set)	1	sets	
b	IP Network Switch 48 port with inbuilt dual power supply unit with rack mounting kit.	1	sets	
c	CAT-6 Cable with connector as per site requirement and drawing no 1 (Min 10 mtr x 3 nos x 28 nos IRD =840 meter per set)	1	set	
4	Essential items/works(If any) to complete the installation of Input and baseband system	1	set	
5	Installation , testing and integration of Input and Baseband system	1	job	
B	**Compression System**			
6	**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	1	set	
b	Inbuilt hot swappable redundant Cross Point module for 64 x 64	1	set	
c	Inbuilt hot swappable redundant controller/ logic modules	1	set	
d	Inbuilt hot swappable Redundant Power supply unit	1	set	
e	X-Y control panel with cable	1	No	
f	Single Bus remote control panel with cable	1	No	
7	**HD-SDI Patch Panel and Patch cord consist of:**			
a	HD-SDI Patch Panel , 75 Ohm Impedence for all input and output ports of SDI Router as per DRG no. 1. (1RU, Normal Through, self terminating type)	1	set	
b	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 1 & 2) between the HD SDI Input Patch Panels to Output Patch Panel via 64x64 SDI Router and upto the Input of Encoders.	1	lot	
c	Female to Female BNC Termination panel for all Input and Output of SDI Router	1	Set	
d	HD-SDI Patch Cord (Impedence -75 Ohm, Cable Length- 3 feet (Minimum))	24	Nos	
e	HD-SDI Patch Cord (Impedence -75 Ohm, Cable Length- 10 feet (Minimum))	8	Nos	
8	**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 32 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 MPEG-2 TS over IP input and decode & re-encode SD & HD TV 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 and Dual redundant power supply units for all encoders.	1	Set	
b	Two Redundant Digital encoder chassis similar to Main Chassis per set without any limitation by way of hardware & software upgradation.	1	Set	

9	**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)	1	Set	
b	IP Network Switch 48 port with inbuilt power supply unit	1	No	
c	CAT-6 Network Cable with connector as per site requirement and drawing no 2 (min. 40 x 3=120 mtr per set)	1	Set	
10	**IP Encapsulator with Multiplexer for Statistical Multiplexing in (1+1) configuration consisting of:**			
a	IP Encapsulater with Multiplexer in (1+1) configuration for Statical Multiplexing having: i) Four Independent ASI Input Port with Licenses ii) Two independent ASI output port with licenses and two mirror ASI output for monitoring (iii) Four Independent IP data Port (bi-directional) with licenses (Two port for Input data & Two port for Two independent MPEG-2 TS over IP Output for transmission)	1	Set	
11	**8x8 or better matrix ASI router (SDI compatible) wired for all input and out put consisting of:**			
a	Base unit fully wired for 8x8 or better matrix Input and Output	1	Set	
b	Inbuilt controller/ logic modules	1	Set	
c	Inbuilt auto switchable Redundant Power supply unit	1	Set	
d	X-Y control panel with cable	1	Set	
e	Single Bus remote control panel with cable	1	Set	
12	**HD-SDI Patch Panel and HD Video cables consist of:**			
a	HD-SDI Patch Panel , 75 Ohm Impedence for all input and output ports of SDI Router as per DRG no. 2. (1RU, Normal Through, self terminating type)	1	set	
b	HD-SDI Video cables with matching connectors as per site Requirement (DRG No. 2) between Output of IP Encapsulator cum MUX to HD SDI Patch Panels; HD SDI Patch Panel to the input of ASI Router and output of ASI Router to HD SDI Patch panel.	1	lot	
c	Suuply, Laying & Integration of HD-SDI cables with matching connectors between Compression room and HPA porta cabin (minimum Distance 30 mtr) as per site requirement	7	Nos	
13	**Network Management System(NMS) for Compression equipment consisting of:**			
a	Compression equipment control system Software	1	Set	
b	Compression equipment control system Hardware consisting of rack mounted main server in 1+1 master -slave configuration or Cluster configuration with client license, each server with dual power supply modules; and KVM switch, Integrated Key Board , mouse & rack mount foldable display monitor.	1	Set	
c	Client work station with required licenses for remote monitoring of all NMS	3	sets	
d	24 port IP Network switch for NMS monitoring with Client Work station in remote locations	3	sets	
e	CAT-6 Cable with connector as per site requirement and drawing no. 2 (Min 30 meter per set)	3	sets	
14	Essential items/Works (If any) to complete the installation of Compression system	1	set	
15	Installation, testing and integration of Compression system	1	job	
16	Two nos. GPS enabled NTP servers with associated accessories for network time synchronization of all broadcast equipment and servers installed in the earth station.	1	set	
17	**Provision of Cable tray consisting of :**			
a	Providing & installing cable tray with cover on top of equipment racks as per site requirement for laying of all cables as per drawing.	1	job	
b	Installation, testing and integration of Cable Tray	1	job	
18	**C- Band receive setup for down link monitoring consisting of :**			
a	C - band receive antenna 120 cm with C band Feed & LNBC	3	sets	
b	Installation of the above 3 Antennae	1	job	
c	RF cables as per site requirement (minimum 150 mtrs)	1	lot	
d	Any other essential item to complete the installation of Antenna system if any	1	set	
e	Installation, testing and integration of Receice Antenna System	1	job	
C	**Monitoring System**			
19	**Confidence level Monitoring system consisting of:**			

a	17 Inch (Nominal) LCD (TFT)Professional Broadcast Colour Monitor with integrated speakers	2	nos	
b	Professional grade Integrated Audio/video Monitor with >= 4'' TFT/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	2	nos	
c	Prof. IRDs {with **L-band inputs of DVB-S & DVB-S2, DVB-ASI & IP input }** 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	2	nos	
d	Prof. IRDs {with **DVB-ASI & IP input }** 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	2	nos	
e	32 x 32 SDI Router with one X-Y pannel, one Single Bus Remote Control Panel, dual Redundant power supply and acccessories	1	set	
f	32x2 HD-SDI/ASI Patch Panel , 75 Ohm Impedence as per DRG no. 3. (1RU, Normal Through, self terminating type)	3	Nos	
g	High Quality Digital Ampli-Speaker having digital AES/EBU and analog Audio Input facility and suitable power supply	1	Set	
h	24 port IP Network switch for Management of monitoring equipment	1	set	
i	12 port IP Patch Panel (RJ-45)	1	Set	
j	IP Patch card with connector (RJ-45)	2	Sets	
k	CAT-6 Cable with connector as per site requirement and drawing no. 3 & 4 (Min 30 meter per set)	1	set	
l	Essential items/works (If any) to complete the installation of above confidence monitoring system	1	set	
m	Installation , testing and integration of Confidence Monitoring System	1	job	
20	**Input and Downlink Monitoring of SDTV and HDTV Channels consisting of:**			
a	Multi viewer display system with remote panel for MPEG-2 TS over IP streams of Input Source signal. Each set shall have inbuilt MPEG-2 & MPEG-4 decoders of 32 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 with two independent video display output as per drawing no. 4.	1	Set	
b	Work station with software licences including one client Licence for controls and cofiguration of Display on 55" Display system	1	set	
c	De-Modulator (DVB-S & S2) with Common interface slot hardware (Max 8 Service per CI slot) and MPEG 2 TS over IP output for 32 TV service per Stream per set (one chassis should consist of multiple modules).	1	set	
d	Multi viewer display system with remote pannel for MPEG-2 TS over IP streams of Down link signal. Each set shall have inbuilt MPEG-2 & MPEG-4 decoders of 32 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 with two independent video display output as per drawing no. 4.	1	Set	
f	Active splitter(L- band) 1-Input and 8 Output	3	Sets	
g	ASI splitters (100 Mbps) as per requirement (1:4)	5	Nos	
h	Interconnecting cables from Multi viewer system to 55" LCD display system for display of stream as per drawing no. 4	1	set	

i	55 inch (nominal) LED display system with wall mount kit, cables and associated accessories.	2	Sets	
j	42/40 Inch (Nominal) LED display System with Stand as per site requirement	2	Sets	
k	Dolby Digital 5.1 audio Home theater	1	Set	
l	Essential items/Works (If any) to complete the installation of above Input and downlink monitoring system	1	Set	
m	Installation , testing and integration of Input and downlonk Monitoring System	1	job	
D	**MEASURING EQUIPMENT**			
21	Digital waveform monitor (with Measurement facility)	1	Set	
22	Colour laser Printer with network printing facility for A4 size	1	Set	
23	B/W laser printer with network printing facility for A3 size	1	Set	
24	Any other essential items/Works to complete the Measuring system	1	set	
25	Installation , testing and system integration of Measuring System	1	job	
E	**POWER SUPPLY SYSTEM**			
26	75 KVA, 3 Phase Delta to Star Isolation Transformer	**1**	**set**	
27	75 KVA, 3 phase+Neutral Oil Cooled AVR	**1**	**set**	
28	2X60KVA (3 Phase) Uninterrupted Power Supply (UPS) operating in (1 + 1) 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 each UPS, internally for suitable rating (minimum 60KVA) consisting of:	1	Set	
a	2x60KVA (3 Phase) Uninterrupted Power Supply (UPS)	1	Set	
b	Audio Visual Remote Monitoring Pannel of UPS with cable	1	Set	
c	12V Maintenance Free VRLA Battery, Minimum 50000 VAH with each UPS Battery Bank, Battery Changeover system & Battery bank stand (one set per UPS)	2	Set	
d	Internal Isolation Transformer	1	Set	
29	PDP with industrial MCCBs &; MCBs and 4 core copper power supply cables with suitable rating to meet the requiremntof all equipment in Earth Station connected with (1+1) UPS power supply system i.e (i) LT panel to Isolation Transformer, (ii) Isolation Transformer to AVR, (iii) AVR to PDP, (iv) PDP to UPS-1 & UPS-2 , (v) UPS-1 & UPS-2 to PDP, (vi) PDP to HPA PDP in Portacabin, (vii) AVR to Uplink Antenna panel etc.	1	Set	
30	SDBs with industrial MCCBs & MCBs to meet the requirement of all supplied equipment with 30% (Nominal) spare capacity to connect additional rack load in future and change over switchconsisting of:			
a	SDBs with industrial MCCBs & MCBs and three core copper power supply cables to meet the requirement of all equipment supplied in compression room connected with (1+1) UPS power supply system	1	Set	
b	Supply, Laying and Integration of Power supply Cables (4 Core Copper) between (1+1) UPS PDPs and above said SDBs (Minimum length-20 mtr)	1	Set	
31	Any other essential items/Works to complete the Power supply system	1	job	
32	Installation, testing and integration of Power Supply System	1	job	
F	**MISCLLANEOUS ITEMS**			
33	Control & operators table made of powder coated MS sheet or aluminium matching with existing table to install remote operations & control computer, digital waveform monitors, Picture monitors, monitoring panel with stereo Loud speaker and other relevant equipments.	1	job	
34	Required no. of 19 ", 1000 mm (depth) equipment rack frames (min 6 nos rack) including Installation material, audio video cables etc *with matching BNC HD connectors* , CAT-6 cable.	1	set	
35	Required no of Mains Distribution Units and Single Phase Auto Changeover Switch (Min 1 no. Single Phase Auto Changeover switch and 2 nos of MDUs per Rack i.e. Total Min. 6 Single Phase Auto changeover Switch and 12 Nos 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 each equipment in every rack	1	set	
36	Industrial type 3 pin Male-Female connector (Min 12 nos) as per site requirement	1	set	

37	Earthing system and earth pits (minimum 7 Nos) (Earth Resistance of each pit < 1 ohm)*Sample picture is enclosed at DRG No.8*	1	set	
38	Installation material and laying of cables protection pipes	1	job	
39	One raised platform/ trolley with wheel and braking arrangements to reach up to overhead cable tray	1	set	
40	Set of tools consisting of video connectors crimping tools with suitable die-sets of all used connectors, BNC puller, cable strippers of all use cables, RJ 45 crimping tool, 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	
41	Integration, Testing & Commissioning of complete supplied system.	1	job	
G	**DOCUMENTATION**			
42	Technical manuals (Hard Copy) for all the equipment supplied	2	sets	
43	Technical manuals (Softcopy) for all the equipment supplied on USB with Search facility etc). (Technical Manual (Softcopy) is to be distributed as follows: 2 set for the station, 1 set for DG DD and 1 set for ADG (NZ))	4	sets	
44	All software backups are to be supplied on USB.	2	sets	
H	**TRAINING**			
45	Three separate Seminars (including theoretical & Practical training, hands on experience) for Doordarshan personnel at site. Atleast , One working day Training of each module shall be delivered by the factory Engineer/personnel of OEM. (This training period is not part of Delivery period).			
a	Base band Equipment (01 working day)	1	job	
b	Digital compression system including NMS (02 working days)	1	job	
c	Monitoring and measurement equipment (01 working day)	1	job	
d	Power Supply System (01 working day)	1	job	