

**PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTORATE GENERAL: ALL INDIA RADIO
(TELECOM DIVISION)**

SPECIFICATION COVER SHEET

TITLE : SPECIFICATION FOR MULTI CHANNEL
STEREO DIGITAL STUDIO TO TRANSMITTER
CONNECTIVITY

SPECIFICATION No. : TC/SPEC/6/2008/D-STL-LINK

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**PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTORATE GENERAL: ALL INDIA RADIO
(TELECOM CELL)**

Subject: Specification for the “Multi-Channel Stereo Digital Studio To Transmitter Connectivity”

1. INTRODUCTION

AIR requires Multi-Channel Digital Microwave Links for transporting of programs from studio Centre to Transmitter locations where all Studio and Transmitter are not Cosited. These Microwave links are to be installed using towers (or structures on top of buildings having clear line of sight) at different locations. The scope of work includes the supply of the Multi-Channel Microwave links as per quantities given in the tender, Pre delivery inspection for acceptance, testing and installation of equipment and commissioning at all sites as per approved ATP.

General specifications/requirements are detailed in Section ‘A’.

Technical specification/requirements are detailed in Section ‘B’.

The Draft ATP for Digital Microwave Link equipment is given in Section ‘C’.

A block diagram showing the Digital Microwave Link set up is enclosed as Annexure-A.

	Up and auto-change over switch	Section.B-E	(1 set at Studio end and 1 set at Transmitter end)
6	Wired Racks , Cables, Connectors and accessories	Refer to Section.B-F	2 Set/Station (1 set at Studio end and 1 set at Transmitter end)
7	Installation and Commissioning of complete link along with provision of proper Earth pits at both Studio and Transmitter end	Refer to Section.B-G	1 Job/Station
8	Training as per tender requirement: 2 Days Training on Operation & Maintenance at each Station to 5 engineers.	Refer to Section A(5)	1 Job/Station
9	Inspection as per ATP	Refer to Section C	1 Job

OPTIONAL ITEMS:

Sl.no	ITEM	Specification	Quantity
1	Training as per tender requirement: 5 Days training on servicing at a central location in each of the five zones.	Refer to Section A(5.3B)	1 Job/Zone (in five Zones)
2	Supply and Installation of Antenna Mounting arrangement inclusive of Civil works on roof Top	Refer to Sec. B-C	Refer Annexure 'B'
3	Details of any other item required for complete integration, operation & testing of Equipment may be furnished with the tender	-----	

2. QUANTITY:

Total Quantity and configuration of Multi-Channel Digital Microwave Link at each of the Stations is given, station wise, in Annexure B.

3. LOCATION FOR SUPPLY:

Equipment is to be supplied at Studios and Transmitter locations at Stations mentioned in Annexure-B.

4. SCOPE

4.1 Eligibility:

- a) The bidder shall have proven experience of carrying out SITC of Microwave Links. Bidders shall provide documentary proof (with attested copies of certificate from client including contact details like Telephone nos. and E-Mail address) of successfully carrying out at least one work of SITC of complete Microwave links of value not less than 50% of tendered cost during last 5 financial years for an established and reputed organisation. Certificates issued by private individuals shall not be acceptable.
- b) Total contract amount received by the bidders during the last 5 financial years and current financial year should be a minimum of 150% of tender value.

Bids without the above valid documents shall be liable for rejection without any further communication.

4.2 The scope of this tender includes supply of the equipment as per specifications, technical requirements and quantities as detailed in the tender, Pre-delivery inspection of the equipment, installation and commissioning of equipment at site and acceptance testing as per mutually accepted and approved Acceptance Test Procedure (ATP). Draft ATP is annexed.

4.3 The equipment offered shall be of renowned make, well established and field proven. A list of clients with contact details, to whom the equipment has been supplied, must be enclosed. Any offer without the above list shall be liable to be rejected.

4.4 The tenderer shall obtain all the technical requirements from indenter before installations. Minor changes at site, if any, necessitated due to site conditions shall have to be taken care of by the supplier during installation without any extra cost to the indenter.

4.5 After Acceptance of the tender, the successful tenderer shall also provide detailed plans of supply of material, **installation link budget calculation sheet for each site**, testing and commissioning as per ATP.

4.6 Inspection:

a) Pre-despatch Inspection:

Pre-despatch Inspection of the links shall be carried out at Supplier/Integrator's works by the Engineers(s) of All India Radio. The expenses towards to and fro journey, DA and lodging as per Govt. of India norms will be borne by Prasar Bharati.

Complete equipment ordered shall be delivered in maximum 4 lots (station wise). Size of each lot is specified under Clause 5.11 (For example, If the lot size is 20 then the lot includes complete set of equipments ordered for 20 stations). Phased Delivery periods for each of the lots are specified in the same table. Pre-dispatch inspection of each of the lot will be taken up separately. Supplier has to ensure that complete set of equipments for a lot are offered, for inspection of that lot.

During the Pre-despatch inspection of each of the Lot, supplier shall put up all the equipments of the lot in one go for test on the test bench at supplier/ integrator premises before the AIR representative and shall provide, without any extra charges, electric energy, consumable materials, tools, testing instruments, labour and assistance of every kind for carrying out acceptance tests. All the individual factory test reports of the complete lot of the equipment shall be made available to the inspecting authority before inspection. Inspection will be carried out as per the sample size specified for the lot. Samples as per specified sample size shall be drawn at random from the equipment. Complete specifications and details for each equipment will be checked and all parameters/ values will be measured. Typical details are enclosed in draft ATP and inspection shall be carried out on these lines. Three weeks prior intimation for carrying out inspection is to be given by the supplier to the indenter. Inspection charges, if any, are to be quoted separately in the commercial bid.

b) Site Inspection:

After completion of Installation of all the equipments at the Station, final inspection of the installation at the Station will be carried out by the representatives of AIR for certifying the Installation. This inspection will include visual examination of the installation, overall performance measurements, link level measurements and any other measurement/ examination considered necessary by AIR. At least seven working days' prior notice shall be given by the supplier for conducting final Site Acceptance test.

5. GENERAL REQUIREMENTS

5.1 Technical/General details

The tenderer, in order to enable the indenter to carry out the full technical evaluation of the tender, should give all the details required to ascertain full merits and demerits of the technical offer.

The bidder shall comply with all the specifications. Any deviation from the specifications has to be clearly brought out in the compliance statement.

- ii) The technical offer shall contain apart from the technical compliance statement, all original data sheets of the manufacturer in support of the technical compliance duly signed by OEM of that equipment alongwith his Name, Telephone. No., Email address. The tenders containing only technical compliance statement without the original data sheet/ pamphlets of the equipment offered in full shall be liable to be rejected. The authorization to supply the equipment from the principals' must be included if not quoted directly by the manufacturer.
- iii) The tenderer may be asked to demonstrate the equipment to show compliance to AIR's specification at the technical evaluation stage. The tenderers shall furnish the list of the customers along with contact details (including Telephone Nos, E-Mail) where similar equipment has been supplied by the tenderer/manufacturers. In the absence of such list, tender may be rejected.

- iv) This equipment shall be of state-of-art technology, capable for 24hourx7days operation and shall establish the link with specified parameters for not less than 25 KM of air distance under city conditions.
- v) During the installation of these equipment supplier shall be responsible for safety and security of his material and personnel. At the same time the supplier shall also ensure that there is no damage to AIR material and personnel. Installation & Commissioning at respective stations shall be carried out without any disruption of AIR/Doordarshan Services. This may require installations at some sites to be carried out even during night hours for which adequate arrangements will have to be made by the supplier at no extra cost to the indenter.
- vi) The tenderer shall ensure that the equipment offered fully incorporate the standard features of safety and protection including shielding from EMI/RFI as the receive end of the Link will be installed at high power transmitter site.
- vii) Provision of RF cable and associated materials as per site requirement shall be made. The rates of RF cables may be quoted on **per meter basis**. However, the offer will be ranked on the basis of a notional cable length of 100 metres each at both ends.
- viii) Apart from printed technical data/specs of the equipment, Block schematic upto the sub-system, interconnection and wiring diagram, photograph etc. must also be attached with the offer.
- ix) Bidder may conduct site survey at all the Stations, if felt necessary, to ascertain the conditions at Stations for facilitating installation of indoor equipments, hoisting of Dish antenna on the tower, routing of the cable, length of the RF cable, etc.

5.2 Spares

Tenderer must quote separately recommended essential spares including their quantities and cost(per unit). The cost of spares shall not be counted for deciding the commercial ranking of tenders. Various RF modules like transmitter, receiver, interface units, Audio Encoder-Decoder modules, Multiplexer-Demultiplexer modules, Power supply modules, etc must be quoted as spares along with other units.

5.3 Training

The tenderer shall provide 2 days training for five AIR Engineers on operation and maintenance of the equipment at each Station. **This will be essential.**

In addition to above 5 days training in each of the Zone(5 Zones) at a central location within the zone for engineers (1 each from station, 1 from respective Zonal office, 1 from STI(T) and one from Dte.) on servicing of equipment will be required to be arranged. The expenses on to & fro journey and DA etc. for the trainees will be borne by AIR. **The cost of this training, if any, may be quoted separately as an optional item.** This shall not be counted for deciding the commercial ranking of tenders.

5.4 Compliance

- a) The compliance from **original equipment manufacturer** only will be considered. While complying to the specifications, it may be noted that just mentioning 'complied' will **NOT** suffice. Compliance should be supported by proper data/documentation and should substantiate the specifications. Each page of the datasheet/specification shall be duly signed, with seal, by both the OEM and tenderers. The full name, Postal and Telephone contact details including E-Mail address of the person signing on behalf of OEM must be indicated on at least one of the pages. Bids not complying with the above shall be liable for rejection.
- b) Deviations, if any, must be brought out clearly in the compliance statement. Compliance Statements and Datasheets should concur with each other. Proposals without the explicit compliance statement shall not be evaluated and would be rejected without any further communication to the bidder.

5.5 Schedule of Material:

A comprehensive schedule of material offered shall be attached with the offer in the same format as mentioned in Section A as price bid minus the price. The price bid shall also be in the same format as the commercial bid. The tenders not complying this will be rejected. Price against each item as indicated in Section A-1(Bill of Material) shall be mentioned separately item wise. Any tender showing only the clubbed price for all the items or a group of items may be rejected.

5.6 Maintenance Support

Maintenance support including availability of spares is to be ensured for at least 10 years from the date of supply. Details of the same should be mentioned in the tender.

5.7 Documentation & Test Certificates:

Following documents shall be supplied by the successful tenderer along with the equipment.

- a) **Manual:** [Two each for the station, Two for Directorate, one each for Zonal office, one for STI (T) and one for R&D].
 - i) Manual for complete link, operation system, as well as each sub-system and accessories (both hard & soft copies)
 - ii) Original manuals for installation and maintenance & servicing along with drawings and wiring diagram for the system.
- b) MTBF figures for all sub systems
- c) Test procedures for parameters measured at subsystem and integrated system levels.
- d) Test records/reports of all the measurements performed for each equipment.
- e) Compliance certificate(s)
- f) Acceptance test reports & certificates for each equipment.

5.8 Environmental & power supply

- a) Ambient Temperature **(for outdoor units)** :
 - 40°C to + 40°C – For Leh, Srinagar and Kargil only
 - 10°C to + 50°C –For other Stations

- b) Relative Humidity : Upto 95% non condensing at 40°C
- c) Safety/features :Standard features for safety & protection have to be built in /incorporated for both personnel/equipment.
- d) Power supply : 230VAC±10%, single phase, 48-52 Hz.

5.9 Miscellaneous Clauses

- i) The tenderer shall mention the source of supply (with proper authorization) and technical parameters for major and critical components/spares so that no difficulty is encountered later on in procuring the spares for maintenance/repair of these equipment.
- ii) If at any stage during next ten years the manufacturer proposes to stop production of these equipment and spares, supplier shall intimate AIR in advance to enable AIR to stock the critical items of spares for the life of the equipment.
- iii) **All the equipments shall carry a warranty for 12 Months from the date of acceptance of installation at site against any manufacturing defects and failures.**
- iv) All optional items mentioned in the tender must be quoted. Failing this, the tender would be liable to be rejected. However, these items would not be considered for ranking purpose.

- 5.10** The tenderer/firm must have a well equipped & established service center in India. The complete address and contact details of the Service centres in India, duly certified by the OEM, shall be indicated. The firm/tenderer must ensure repairs within 72 hours at site & in case the equipment can not be repaired at site then the firm shall bear all the charges including to & fro freight charges to repair the equipment within or outside the country during the warranty period. In such case the Warranty/Guarantee will be extended for duration of any such failure beyond 72 hours.

After sales service is to be ensured for post warranty period also.

5.11 Delivery Period:

The equipment shall be delivered in a maximum of 4 lots and entire installation and commissioning shall be completed as per following schedule:

LOT	Lot size (Minimum)	Minimum Sample size for pre-despatch Inspection	DP for Supply to Stations from the date of placement of Advance A/T	DP for completion of Installation & commissioning at the Stations from the date of placement of Advance A/T
FIRST	20 complete sets for 20 Stations	5 complete sets	4 months	7 months
SECOND	25 complete sets for 25 Stations	7 complete sets	6 months	9 months
THIRD	25 complete sets for 25 Stations	7 complete sets	8 months	11 months
FOURTH & FINAL	Rest of the sets for rest of the Stations	8 complete sets	9 months	12 months

Note: The Sample shall be drawn at random from the lot offered.

List of stations (priority wise) where equipment shall be supplied and installed in each lot shall be intimated at the time of placement of purchase order.

SECTION-B

TECHINCAL SPECIFICATIONS FOR MULTI-CHANNEL DIGITAL STEREO MICROWAVE LINK

A. TRANS-RECEIVE EQUIPMENT

Trans-Receive equipment housed in a chassis should be supplied in 1+1 hot standby configuration. Transmitter section of this RF equipment should be capable of receiving E1 from the Audio baseband equipment and the receive section should be capable of retrieving the E1 data from the RF receiver and feed it into Audio baseband equipment for facilitating demultiplexing of the Audio.

KEY FEATURES:

1. Full duplex operation.
2. Should be capable of delivering 1E1 data within 500 KHz channel bandwidth.
3. 19 inch rack mounting.
4. Each Trans-Receive unit should be capable of working independently in case of failure of Auto-Change over switch. All connectors and cables required for independent operation of standalone Trans-Receive unit shall be supplied.

i) SYSTEM:

1	a) Frequency of operation: b) Step Size: c) RF Frequency Stability: d)Tx-Rx Spacing:	1427-1525 MHz, Fully Synthesized, tunable Less than 1MHz. Better than 3 PPM. It should be possible to Transmit and Receive simultaneously frequencies spaced 49MHz apart
2	Modulation/Demodulation (User Selectable)	1. QPSK and 2. Either of 16QAM or 32QAM or 64QAM, whichever shall realize RF Bandwidth of < 500KHz for 1E1 Data
3	RF Bandwidth	< 500KHz (Specify the Modulation for which Bandwidth is < 500KHz).
3.	Data Rates:	1E1.
4	Interfaces: a) Data: b) Antenna: c) Service Channel: d) Orderwire: e) Ethernet: f) Console Port:	G.703 50 Ohm. RS232 @9600bps. Voice handset interface 10Base-T RS232, 9600 bps
5	Forward Error correction	Reed Solomon
6	WorkStation and Network Monitoring software from Original Equipment Manufacturer for Local and Remote Status & Control:	Refer to Section B- Item D.

7	Diagnostics Function: a) Via Front panel display: b) Data Loopback:	Power, General Alarm, Rx & Tx Alarm, I/O Alarm Measurements of RF Power, BER. Local and Remote
8	Configuration: a) Switchover to stand-by mode: b) Insertion loss for Switch over unit of (1+1) mode	(1+1) Hot standby with auto changeover with manual over-ride. ≤ 3 dB
9	Power Supply	12/24/48V DC
10	Standard Compliance:	ETSI/EN International Standards for EMC/EMI and Radio Performance.
11	Size	19" Rack mount.

ii) TRANSMITTER

1.	a) RF O/P power at Antenna Port I/P: b) RF O/P Power Control:	=30dBm (for Modulation realizing RF Bandwidth of ≤500KHZ @1E1 Data Rate) Step size of 1dB
2.	Spurious and Harmonics Emission	< - 60 dBc

iii) RECEIVER

1	Receiver Sensitivity (for 10^{-6} BER)	Better than -90 dBm (for Modulation realizing RF Bandwidth of ≤500KHZ @1E1 Data Rate)
2	Dynamic Range	Better than 50 dB (for Modulation realizing RF Bandwidth of ≤500KHZ @1E1 Data Rate and BER of 10^{-6}).

B. TECHNICAL SPECIFICATIONS OF AUDIO BASEBAND UNIT

I. Baseband Audio Encoder/ Decoder Modules with Mux/ Demux Card , Monitoring and Control card, power supply unit cards and accessories with redundancy

The audio base-band Unit should be a separate unit & not an integral part of the RF equipment. The system should be offered preferably as **single** main chassis frame housing following Hot Plug in cards at the Sending end and Receiving end. In case the system is offered housed in two chassis frame, then redundancy for power supply unit and Multiplexer card should be maintained in each of the two chassis:

Sending End:

- 1) Power Supply unit(1+1)
- 2) Audio Encoder cards (2+2 or 3+3 or 4+4 or 5+5 or 7+7as per Site details in Annex-B)
- 3) Fractional E1 Mux card(1+1)
- 4) Monitoring and Control card(1+0)

Receiving End:

- 1) Power Supply unit(1+1)
- 2) Audio Decoder cards (2+2 or 3+3 or 4+4 or 5+5 or 7+7as per Site details in Annex-B)
- 3) Fractional E1 Demux card(1+1)
- 4) Monitoring and Control card(1+0)

This unit should fulfill the technical requirement of Endlink equipment by multiplexing/demultiplexing audio channels occupying bandwidth from 64kbps to 384 Kbps (in 64 kbps increments) and interface at the O/P with E1 circuits which are being provided by MTNL/ BSNL or Microwave link (Trans-Receive equipment (specified – Section B-Item A)). The unit should be ITU-T G.703 complaint.

Encoder and Mux cards are to be provided at Studio site and Decoder with Demux cards are to be provided at Transmitter site. The Encoder/Decoder modules must support both analog & digital input/outputs (user selectable through a switch /software). The system should be designed for continuous 24 Hours operation and should be software upgradable. The system should have capability for remote configuration, monitoring and control, Fault logging and alert through Network Management software from OEM using Laptop Workstation. Appropriate redundancy as described in following sections should also be provided in the system.

Encoder, Decoder, Multiplexer, Demultiplexer and Power Supply cards should be hot swappable.

Diagram of the Chassis indicating location/housing of different modules within the chassis shall be given.

(i) **BASE BAND AUDIO ENCODER- DECODER MODULE:**

1.	Audio Input(to Encoder)/ Audio output(from Decoder)	Digital (AES/ EBU)and Analog (user selectable)
2.	Mode	Mono, Dual Mono, Joint Stereo, Stereo
3.	Configuration	Station wise details of audio channel configuration at Studio and Transmitter site is indicated at Annex-B. (1+1) configuration means one stereo channel is active and one stereo channel is redundant. For such a configuration 2 Nos of Encoder/Decoder cards has to be given (1 Stereo channel per card). Similarly for a (2+2) configuration means two stereo channels are active & two stereo channels are redundant. Similar configuration for higher number of channels shall apply.
4.	Frequency Response	20 Hz to 15 KHz
5.	Audio input level (nominal at 1 KHz)	0dBu
6.	Audio input level (Max. at 1 KHz)	18 dBu above nominal
7.	Input Impedance (For Analog)	600 ? Balanced / =10 K ? (Selectable)
8.	Audio output level (nominal at 1 KHz)	0dBu
9.	Audio output level (Max. at 1 KHz)	18 dBu above nominal
10.	Output Impedance (For Analog)	600 ? / =100 ? (Selectable)
11.	Input / Output Impedance (For Digital)	110 ?
12.	Input / Output connectors	XLR. In case the connectors on the encoder/decoder modules are different from XLR, suitable adopters for terminating audio input/output on XLR connectors shall be provided and all XLR connectors shall be terminated on a back panel in the rack at no extra cost to the indentor.
13.	Coding Algorithm	MPEG 1 Layer II
14.	A to D Conversion	24 Bit
15.	Sampling Frequency	48 KHz

16.	Freq. Response (20 Hz to 15 KHz)	± 0.5 dB w.r.t 1KHz at nominal level
17.	THD (1 KHz at max output level)	Less than 0.1%
18.	Level adjustment step	=1.5 dB
19.	Dynamic range	= 90 dB
20.	Cross talk	Better than 80 dB
21.	SNR	Better than 85 dB
22.	Data rate	Configurable 64, 128,192, 256,384 kbps per stereo channel
23.	Auxiliary Data channel	One, upto 9.6 kbps, Serial RS 232
24.	Mounting	19" Rack
25.	Redundancy	Modules for Redundant channels should be in Hot Standby mode. Two power supply cards/Modules(one active & one in hot standby) shall be provided with auto changeover mechanism (in each chassis).

(ii) FRACTIONAL E1 MULTIPLEXER / DEMULTIPLEXER :

This unit should fulfill the technical requirement of Endlink equipment by multiplexing/demultiplexing audio channels occupying bandwidth from 64kbps to 384 Kbps (in 64 kbps increments) and interface at the O/P with E1 circuits which are being provided by MTNL/ BSNL or Microwave link (Trans-Receive equipment (specified -Item A)). The unit should be ITU-T G.703 compliant. It should have Status LED's and test port for in-service maintenance. The unit should be provided in 1+1 configuration with auto switchover mechanism. The system should have following specifications:

1.	Aggregate Throughput Rate	E1
2.	Data Rate:	Audio I/P: 64Kbps to 384Kbps in 64Kbps steps
3.	Interface	Should be able to connect directly to E1 trunks and also to G.703 Compliant Radio link equipment. Should conform to CCITT G.703
4.	Connector	RJ 45.
5.	Protection	E1 outputs to be transformer – isolated
6.	Jitter Tolerance	Shall Conform to CCITT Standard
7.	Input Impedance	120 Ohms
8.	Output Impedance	120 Ohms
9.	Configuration	Mux at Transmit end and Demux at Receive end
10.	Redundancy	1+1 with auto switchover.

(iii) MONITORING AND CONTROL

1.	LED Indicators	Power ON, Normal operation, Alarm, Errors , Out of frame, Loopback ON etc.
2.	Auxiliary Data	Upto 9.6 kbps
3.	Remote access interface	Serial RS232 Asynchronous Ethernet 10Base-T
4.	Signals supported	Send Data, Serial clock timings, Receive Data, signal ground etc.

C) ANTENNA (TRANSMIT/RECEIVE) ALONG WITH FEED & R.F. CABLE

Antenna should be of reputed make similar to Andrews/RFS/Gabriel, etc & should be fully compatible with RF part of the link. All the parts of the antenna such as mounting fixtures etc. must be of same make and should be the part of the antenna kit from the same manufacturer. Antenna should be supplied with Deicing arrangements for installation at AIR Leh, Kargil and Srinagar.

A 5 metre high GI Steel structure/ pipe is required to be supplied and installed over the Roof top (including associated civil works) wherever no towers are present at the station and Antenna is required to be mounted over the roof top. This steel structure is required to be quoted as an optional item.

1.	Diameter (nominal)	= 2 M
2.	Gain (dBi) (midband)	= 26dBi
3.	Front to back ratio (dB)	= 30
4.	Power Rating	50 W
5.	Polarization (mono-polar)	Linear adjustable(Vertical or Horizontal)
6.	Impedance	50 ohm (N.connector)
7.	Type	Grid pack/Flat panel
8.	Weight(including mounting fixture)	=50 kg
9.	Azimuth adjustment (degree)	180 degree
10.	Elevation, adjustment (degree)	+/-10 degree
11.	Wind velocity (Survival)	180 Kmph
12.	Return loss	Better than 20 dB
13.	R.F. cable loss at 1.5 Ghz	= 5 dB per 100 Meters
14.	R.F. cable impedance	50 Ohm
15.	De-icing System(For AIR Leh, Srinagar & Kargil only) to operate on 230 VAC \pm 10%, single Phase 48-52Hz.	Suitable De-icing system may be provided with Antenna so that system remains operational during and after snow fall.

D) WORK STATION FOR NETWORK MONITORING SOFTWARE (NMS):

Laptop/Notebook computer similar to HP/IBM/COMPAQ/Dell of reputed brand make shall be provided individually at both Studio and Transmitter end. Laptop/Notebook computer shall be loaded with NMS from Original Equipment Manufacturer(OEM) for both R.F. Trans Receive equipment and Audio Base-band equipments as indicated in Bill of Material. The NMS should be capable of monitoring the status, controlling and setting operational parameters of R.F. Trans Receive equipment and Audio Base-band equipments. NMS should be also capable of configuring and monitoring receive side RF and Baseband equipment from transmit side itself and Vice versa. Any hardware keys (dongle), if required, for operation of NMS shall be supplied at each end. The laptop shall be mounted in a sliding lockable shelf in the rack.

I) NMS features :

The NMS (with license) must be using the industry standards SNMP as the underlying framework for managing network devices, providing a simple, intuitive suite of tools to configure network elements, monitor performance, detect and correct faults quickly.

It should allow remote performance monitoring, fault management, BER measurements, Security management, configuration and control of MW link equipment and Audio Baseband equipment,

- Network diagnostics for MW Link
- Proactive alarm/fault notification
- Remote network configuration
- Based on industry standard SNMP easy to integrate
- Graphical and Tabular displays-simple to use
- Embedded firmware reprogramming
- Event log upload and viewer

II) Specifications of Laptop/Note Book Work Station:

Laptop/Notebook shall be rack mountable.

- a) CPU:** Intel(R) Core(TM) 2 Duo Processor ,1.8 GHZ or latest version, 2MB Cache
- b) RAM:** minimum 2GB DDR2 SDRAM
- c) HDD:** 160 GB Hard Drive,
- d) Optical Drive :** Internal 8X DVD+/-RW Combination Drive with dual layer write capabilities.
- e) Net work interface card:** 10/100 BaseT NIC card
- f) Operating System:** Pre loaded Genuine Windows Vista(TM) OS Recovery CD media including all drivers etc, McAfee(R) Security Center(TM), Fully loaded configuration.

- g) Display:** 15" Widescreen WXGA (1280x800) TFT Display
- h) Modem:** 56Kbps
- i) Ports:**
 - i) Serial Comm: 1 Nos or more (RS 232)**
 - ii) Parallel: 1 Nos**
 - iii) USB 2.0: 3 Nos or more**
- j) Battery Pack:** 6Cell (Lithium Ion)
- k) Media reader and mouse:** Integrated 6 in 1 media reader, touch pad with scroll mouse.
- l) Communication:** Intel Pro/Wireless, 802.11b (Mini-PCI) pre-installed, Wireless LAN, Integrated blue tooth.
- m) Standard Features :** 2 years comprehensive Warranty(both hardware and software). At least 3 Hrs battery back up, light weight (=3 kg, including batteries) ultra High Brightness, A/C power adapter/charger.

E) DUAL UPS (Rack Mount Version):

Two Nos. of Rack Mount version UPS, similar to APC/Libert/Emerson shall be supplied in (1+1) configuration along with auto change-over switch at both Studio and Transmitter end. One of the UPS will be in circuit and the other one will be in hot Standby mode.

1.	Type	On line, pure sine wave
2.	Power rating	2 KVA, Single phase
3.	Battery back up	For 30 minutes operation on full load
4.	Type of Battery	Sealed Maintenance free battery having a life time of more than 3 years. Separate Battery pack has to be provided for individual UPS. (Batteries need not be Rack Mounted)
5.	Input voltage range	160-280 V A/C (at full load)
6.	Input frequency range	45-65 Hz (auto selection)
7.	Output Voltage	230V, 50 Hz, Single phase
8.	Output Voltage regulation	+/- 1% static, 5% dynamic
9.	Output frequency	50 Hz +/- 0.1 Hz
10.	Bypass feature	Automatic & manual both
11.	Type of approval	ISO certified, standard, reputed make
12.	Ripple	Less than 0.5% for DC output (battery charging voltage)
13.	Efficiency at full load (nominal input)	Better than 88%
14.	Metering & indicators	It should be possible to monitor input & output voltage, Load etc. through Meters/Indicators/Network Management Software(NMS). It should also be possible to monitor all types of alarms.

F. WIRED RACKS FOR EQUIPMENT

All the above indoor equipment including work station shall be installed in the full size, 16 SWG wired rack of height 42U and overall depth of not more than 700 mm along with requisite jack- strip, Tag block & other items both at transmitting and receiving site. The rack shall be similar to President/ Comcon/ HCL make. The rack must be properly fitted, grouted and earthed. The rack shall be powder coated as per six tank process with air ventilation. It shall be fitted with cooling fan, light, power distribution board with proper RFI and EMI fitters. The jack strip, Tag block, cables and connectors used must be of highest professional quality. All these items shall be of reputed brand and brand. The brand offered shall be mentioned in the bid (Ordinary cables and connectors shall not be accepted).

Typical Patch panel configuration for a 4+4 audio channel configuration system is shown at Annexure-'C'. For other audio channel configurations similar wiring has to be adopted to cater to all channels.

G. INSTALLATION & COMMISSIONING

Installation will include installation of all the equipments within the wired racks, hoisting of the dish antenna over the towers or the roof top steel structure, routing of the RF cable from the antenna in a tray to indoor system and providing earth pits as per AIR Specifications at both the Studio and Transmitter end at each of the Station. Racks and all the equipment must be dual earthed. The workmanship of the entire Installations shall be of highest professional standard.

The firm shall have to arrange all the installation material required for installation and insure all the personnel climbing the towers at their own risk. Any fixtures, clamps or mounting accessories needed for hoisting the dish on the tower and laying RF cable has to be arranged by the firm and will be galvanised. Installation schedule at Stations has to be intimated at least 3 weeks in advance.

Complete Installation at each station shall thereafter be offered for Site Acceptance Test. Inspection at site shall be conducted by the representatives of DG:AIR.

SECTION C

DRAFT ATP FOR DIGITAL MICROWAVE LINK

1. INTRODUCTION

This document describes the Acceptance Test Procedure (ATP) for testing the various units of the Digital Microwave Link Equipment under procurement. It covers the details of the item to be tested, list of equipment required for testing and the tests required to be carried out.

2. ITEMS TO BE TESTED

The items to be tested first individually and then integrated are as follows:-

a) Individual Items

- i) R.F. Tran receive Equipment
- ii) Base Band Unit
- iii) Other peripheral equipment such as Computer & UPS etc.
- iv) NMS

b) Integrated Setup

Complete integrated setup from Audio input to base-band unit to audio output from base band unit

3. TEST EQUIPMENT

a) All requisite test equipment conforming to the required standard for testing and commissioning shall have to be provided by the supplier.

b) Indicative List of the test & measuring equipment:

- i) Spectrum Analyzer (>2 GHz range)
- ii) Power Meter with sensor & Attenuator etc.
- iii) Frequency counter
- iv) Signal Generator
- v) Audio Analyzer
- vi) BER Tester
- vii) Digital Modulation Analyzer having Digital demodulation feature.
- viii) PC with Printer
- ix) Directional Coupler, inter-connecting cables, attenuators, combiners, Dividers, etc. as may be necessary for the tests.
- x) Any other equipment and standard reference source/setup necessary for measurements.

4. TESTS REQUIRED TO BE CARRIED

(NOTE: This is only a tentative list, additional items of tests may be specified by the indenter, if needed.).

4.1 RF TRANS-RECIEVER

- i) Functionality test for individual RF Trans-receiver and in (1+1) configuration
- ii) Functionality check for individual monitoring setups
- iii) Power output check
- ii) Frequency stability.
- iii) Spurious & Harmonics
- iv) RF Bandwidth
- v) Data rate & Digital modulation.
- vi) Receiver Sensitivity, Dynamic Range.
- vii) Service channel, Order wire functionality.
- viii) Any other tests to check the conformity to the specs.

4.2 AUDIO BASE BAND UNIT

- a) Functionality test for individual Base-Band unit
- b) Coding standard, data rates check
- c) Auto change over functionality of Power Supply modules, Mux/Demux, E1 interfaces.
- d) All Base-band measurements i.e. Frequency response, THD, Noise level, Cross talk etc. as mentioned in ATP.

4.3 INTEGRATED SETUP

- i) After the individual tests the equipment will be installed and integrated to work as MW link as per specs. The integrated setup will then be tested for complete system performance and functions.
- ii) The tests for commissioning would include the integration check and conformity to system specs including.
 - a. EIRP
 - b. Radiation conformity to standard specified
 - c. Emissions conforming to international standard. Overall performance measurements to meet the specs.
 - d. Cable Loss(both at Transmitting & Receiving end)
 - e. Alignment of dish for optimum performance

4.4 PERIPHERAL EQUIPMENT

All peripheral equipment shall be tested for the various functionality prescribed and conformity with these specifications.

4.5 In addition all the manuals/drawings will be inspected for completeness.

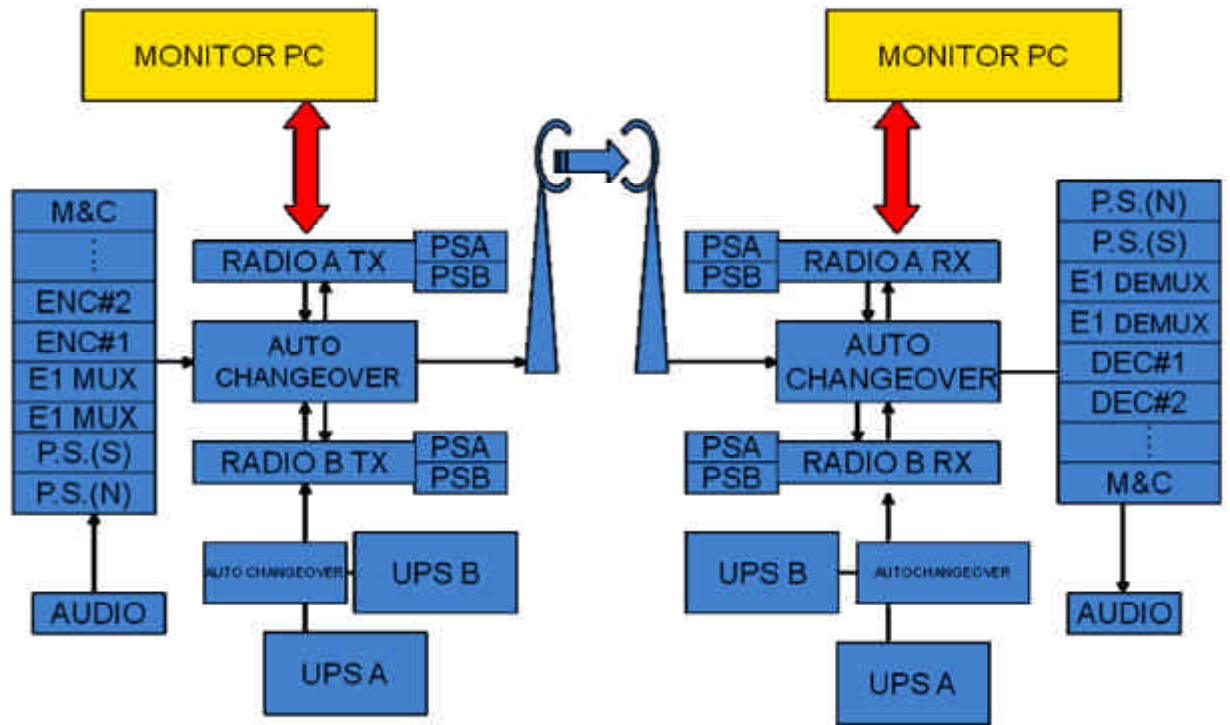
5. GENERAL

i) Based on above supplier is required to give a detailed ATP document giving procedure for tests of individual item as well integrated setup. This should include test setup, equipment details, inter-connection diagram and the format for test reports.

ii) The indentor will examine the same and then ATP shall will be finalized after mutual discussion.

SYSTEM SETUP BLOCK DIAGRAM

Annex-A



LIST OF STATIONS WHERE STUDIO TO TRANSMITTER CONNECTIVITY IS PROPOSED TO BE REPLACED.**I) NORTH EAST ZONE :**

State/Station	From	To	RF Trans-receive Quantity	Audio channel Configuration in 1+1 configuration	Quantity of 5M high Roof Top Structure
ARUNACHAL PRADESH					
1. PASSIGHAT	STUDIO	TX	2 Sets	2 Sets	
2. TEZU	STUDIO	TX	2 Sets	2 Sets	
3. TAWANG	STUDIO	TX	2 Sets	2 Sets	
4. TEZPUR	STUDIO	TX	2 Sets	2 Sets	
5.KOKRAJHAR	STUDIO	TX	2 Sets	2 Sets	
6. ITANAGAR	STUDIO	TX	2 Sets	2 Sets	2 Nos
ASSAM					
7. GUWAHATI	STUDIO	FM-TX	2 Sets	2 Sets	1 Nos
8 GUWAHATI	STUDIO	MW-TX	-----	4 sets	
9. SILCHAR	STUDIO	MW-TX	2 Sets	2 Sets	
10. SILCHAR	STUDIO	FM-TX	2 Sets	2 Sets	
11.DIBRUGARH	STUDIO	TX	2 Sets	2 Sets	
MANIPUR					
12.IMPHAL	STUDIO	TX	-----	2 Sets	
MEGHALAYA					
13.SHILLONG	STUDIO	REPT	2 Sets	4 Sets	1 Nos
14.SHILLONG	REPT	TX	2 Sets	2 Sets	1 Nos
15.TURA	STUDIO	TX	2 Sets	2 Sets	
SIKKIM					
16.GANGTOK	STUDIO	MW-TX	-----	2 Sets	
17.GANGTOK	STUDIO	FM-TX	2 Sets	2 Sets	
MIZORAM					
18 .AIZWAL	STUDIO	TX	2 Sets	3 sets	2 Nos

II) EAST ZONE:

State/Station	From	To	RF Trans-receive Quantity	Audio channel Configuration in 1+1 configuration	Quantity of 5M high Roof Top Structure
BIHAR					
1.DARBHANGA	STUDIO	TX	2 Sets	2 Sets	
ORISSA					
2.CUTTACK	STUDIO	MW TX	2 Sets	2 Sets	
3.CUTTACK	STUDIO	FM TX	2 Sets	2 Sets	
4.BHAWANI PATNA	STUDIO	TX	-----	2 Sets	
5.ROURKELA	STUDIO	TX	2 Sets	2 Sets	
6.SAMBALPUR	STUDIO	TX	2 Sets	2 Sets	
JHARKHAND					
7 RANCHI	TV site	MW TX	2 Sets	2 Sets	
8. HAZARIBAGH	STUDIO	TX	2 Sets	2 Sets	
WEST BENGAL					
9 .KURESEONG	STUDIO	MW TX	2 Sets	2 Sets	1 Nos
10. KURESEONG	STUDIO	FM TX	2 Sets	2 Sets	

III) SOUTH ZONE :

State/Station	From	To	RF Trans-receive Quantity	Audio channel Configuration in 1+1 configuration	Quantity of 5M high Roof Top Structure
TAMILNADU					
1. CHENNAI	STUDIO	HPT	2 Sets	5 sets	
2. CHENNAI	STUDIO	FM TX	2 Sets	2 sets	
3. MADURAI	STUDIO	TX	2 Sets	2 sets	
4. TRICHY	STUDIO	TX	2 Sets	2 sets	
5. KODAIKANAL	STUDIO	FM TX	2 Sets	2 sets	
6. TIRUNELVELI	STUDIO	TX	2 Sets	2 sets	
ANDHRA PRADESH					
7. HYDERABAD	STUDIO	HPT	2 Sets	4 sets	
8. HYDERABAD	STUDIO	FM TX	2 Sets	3 sets	
9. VIJAYWADA	TV site	MW TX	2 Sets	2 sets	
KARNATAKA					
10. BANGALORE	STUDIO	HPT	2 Sets	2 sets	1 Nos
11. SPT BANGALORE	STUDIO	SPT	2 Sets	2 sets	
12. BHADRAWATI	STUDIO	TX	2 Sets	2 sets	
13. DHARWAD	STUDIO	MW TX	2 Sets	2 sets	
14. GULBARGA	STUDIO	TX	2 Sets	2 sets	
15. MANGALORE	MANGAL ORE	UDIPI	-----	2 sets	
KERALA					
16. CALICUT	STUDIO	TX	2 Sets	2 sets	
17. TRICHUR	STUDIO	TX	2 Sets	2 sets	
18. TRIVANDRUM	STUDIO	SW TX	2 Sets	2 sets	
19. TRIVANDRUM	STUDIO	MW TX	2 Sets	2 sets	
20. COCHIN	STUDIO	FM TX	2 Sets	2 sets	

IV) WEST ZONE :

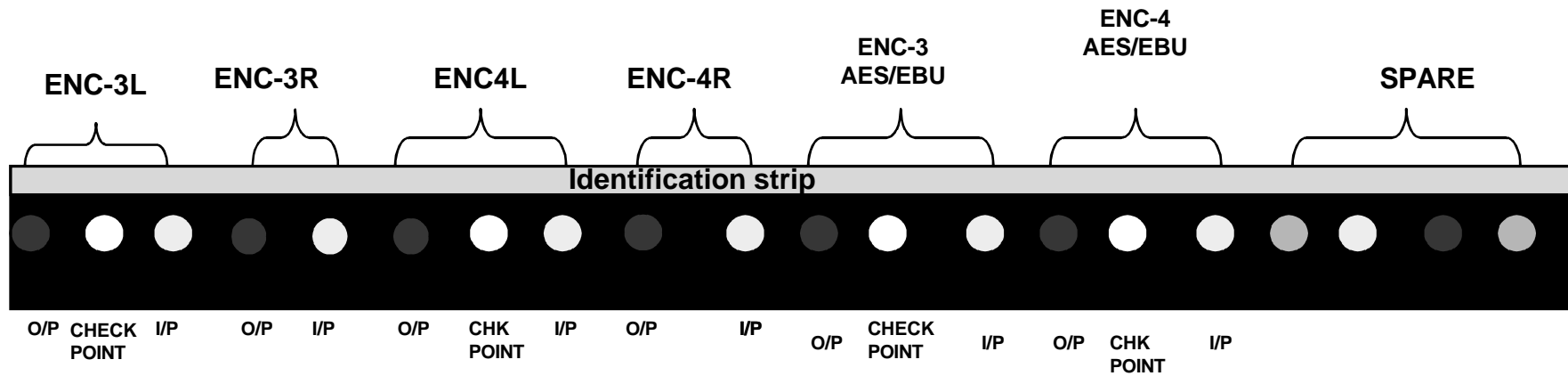
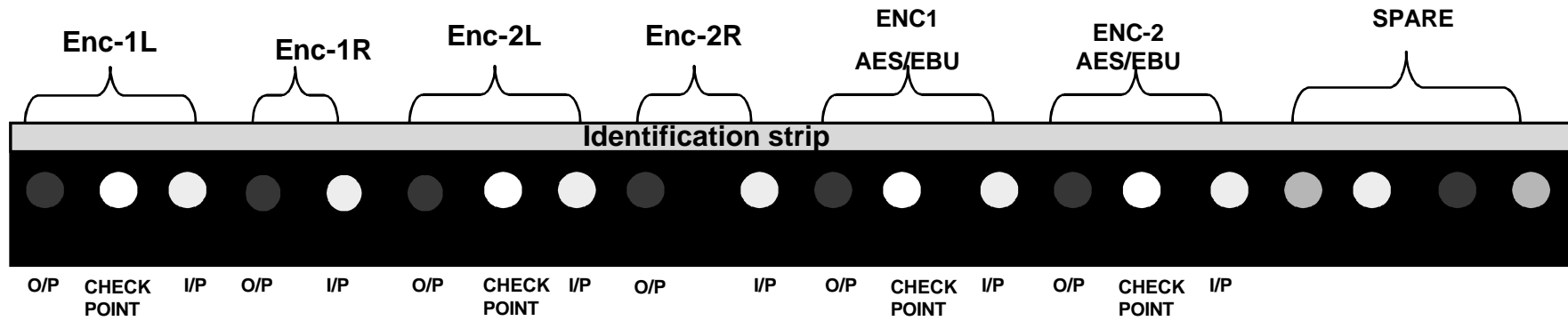
State/Station	From	To	RF Trans-receive Quantity	Audio channel Configuration in 1+1 configuration	Quantity of 5M high Roof Top Structure
MAHARASHTRA					
1. NAGPUR	STUDIO	FM TX	2 sets	4 sets	2 Nos
2. NAGPUR	FM TX	HPT	2 sets	2 Sets	
3. NAGPUR	FM TX	SPT	2 sets	2 Sets	
4. PUNE	STUDIO	MW TX	2 sets	2 sets	
5. PUNE	STUDIO	FM TX	2 sets	2 sets	
6. KOHLAPUR	STUDIO	TX	2 sets	2 sets	
7. MUMBAI	BH	WORLI	2 Sets	7 Sets	
8. MUMBAI	WORLI	MALAD	2 Sets	5 Sets	
GOA					
9. PANAJI	STUDIO	TX	2 sets	3 Sets	1 Nos
GUJARAT					
10. AHMEDABAD	STUDIO	HPT	2 sets	2 sets	
11. AHMEDABAD	STUDIO	FM TX	2 sets	2 sets	
12. BHUJ	STUDIO	TX	2 Sets	2 sets	
MADHYA PRADESH					
13. BHOPAL	STUDIO	MW TX	2 sets	2 sets	
14. BHOPAL	STUDIO	FM TX	2 Sets	2 sets	
15. CHATTARPUR	STUDIO	TX	2 sets	2 sets	
16. INDORE	STUDIO	FM TX	2 sets	2 sets	
17. INDORE	STUDIO	MW TX	2 Sets	2 sets	
18. JABALPUR	STUDIO	TX	2 sets	2 sets	
19. JAGDALPUR	STUDIO	TX	2 sets	2 sets	

V) NORTH ZONE :

State/Station	From	To	RF Trans-receive Quantity	Audio Channel Configuration in 1+1 configuration	Quantity of 5M high Roof Top Structure
HIMACHAL PRADESH					
1. SHIMLA	STUDIO	TX	2 Sets	2 sets	
JAMMU & KASHMIR					
2. SRINAGAR	NARBAL	PAMPORE	2 Sets	2 sets	
3. JAMMU	STUDIO	TX	2 Sets	2 sets	
4.KARGIL	STUDIO	TX	2 Sets	2 sets	2Nos
5. LEH	STUDIO	TX	2 Sets	2 sets	
PUNJAB					
6. JALLANDHAR	STUDIO	FM TX	2 Sets	5 sets	
7. JALLANDHAR	STUDIO	MW TX	2 Sets	3 Sets	
RAJASTHAN					
8. JAIPUR	STUDIO	TX	2 Sets	2 sets	
9. UDAIPUR	STUDIO	TX	2 Sets	2 sets	
10. CHITTORGARH	STUDIO	FM TX	2 Sets	2 sets	1Nos
11. BARMER	STUDIO	TX	2 Sets	2 sets	
12. SAWAIMADHOPUR	STUDIO	FM TX	2 Sets	2 sets	
13 JAISALMER	STUDIO	FM TX	2 Sets	2 sets	
14. AJMER	JAIPUR	AJMER	-----	2 sets	
U P					
15. LUCKNOW	STUDIO	TX	2 Sets	4 sets	
16. ALLAHABAD	STUDIO	TX	2 Sets	2 sets	
17. GORAKHPUR	STUDIO	TX	2 Sets	2 sets	
18. AGRA	STUDIO	TX	2 Sets	2 sets	
HARYANA					
19 Rohtak	STUDIO	TX	2 Sets	2 sets	
DELHI					
20. DELHI	NBH	MALL ROAD	2 Sets	4 sets	
21. DELHI	NBH	PITAMPURA	2 Sets	4 sets	
22. DELHI	NBH	KINGSWAY	2 Sets	7 Sets	
23. DELHI	NBH	NANGLI	2 Sets	7 Sets	
24. DELHI	NANGLI	KHAMPUR	2 Sets	5 Sets	

Representative diagram of Typical 4+4 audio configuration
Jack Strip Patch Panel at transmission side

Annex.-C



Representative diagram of Typical 4+4 audio configuration Jack Strip Patch Panel at Receive side

