

RADIO MODEM (TYPE-A) (DE700402/A1)



INTRODUCTION:

ITI, Bangalore Plant designed and developed Radio Modem as per TEC GR specification No: TEC/GR/R/ISM-MOD-001/04.MAR 2016. The Radio Modem Type-A (DE700402/A1) is a data communication device for the Indian Telecommunication Network, and the system works in Point to Point mode of operation with the operating frequency range of 5.8 GHz (5825 to 5875 MHz). The system is equipped with OFDM (Orthogonal Frequency Division Multiplexing) modulation technique and will work in TDD (Time Division Duplex) mode with different Channel Bandwidths 5/10/20/40 MHz. The Radio Modem Type-A support's 1E1, 2E1, 4E1, 8E1 traffic and Ethernet traffic as well. It can be used for wireless connectivity (for voice and data) between two sites. The system will work up to maximum of line of site distance 20km. Please refer Table-3 for maximum feasible LOS distance for working.

FEATURES:

- Supports 1E1,2E1,4E1,8E1 traffic (G.703/704) ports G.783/784 Compliant
- Up-to 5 Ethernet Ports (2 for PoE ports)
- Passive Splitter supports 8E1 Ports (8 x 2048 Kbps)
- 10/100 Mbps Ethernet Ports
- Ethernet Capacity 10 Mbps/50 Mbps/100 Mbps
- Supported Channel Bandwidth – 5,10,20,40 MHz
- Supported Adaptive Coding and Modulation (ACM)
- Supported OFDM
- Inbuilt POE
- Supported Frequency range – 5.8 GHz (5825 to 5875 MHz)
- Duplexing Mode- TDD
- QoS and VLAN capabilities
- Supported IEEE802.3 and IEEE802.1Q
- Supported Protocol- IEEE 802.1ad (Q-in-Q)
- Supports IEEE 1588v2 PTP and SyncE.
- Supports 1+1 Redundancy at both IDU and ODU level
- Passive Splitter for E1 Redundancy.
- Complied to TEC GR: TEC/GR/R/ISM-MOD-001/04.MAR 2016.



Indoor Unit (IDU) (DE700403)



Passive Splitter (DE700407)



ODU
(DE700405)



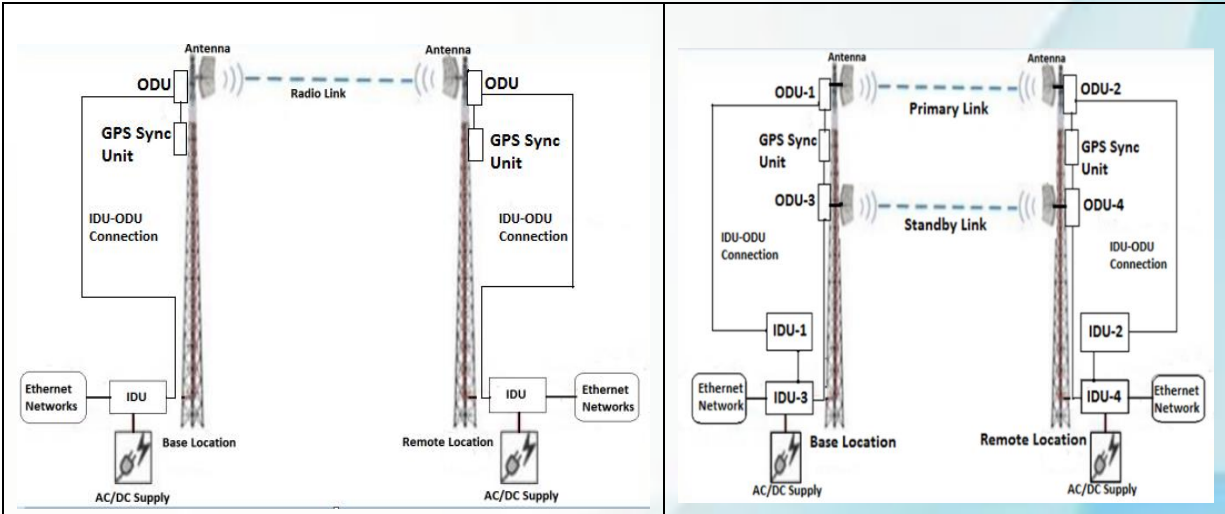
GPS Sync Unit
(DE700410)



Antenna (DE700406)

1+0 CONNECTIVITY:

1+1 CONNECTIVITY



The typical setup for a point to point communication is shown in the above figure. The Radio Modem Type-A is a split type unit, it includes an Indoor unit (IDU-DE700403), Outdoor unit (ODU-DE700405) and GPS Sync unit (DE700410). IDU unit takes E1 and Ethernet data and send them into ODU over PoE interface. ODU unit is an IP67 Complied unit which takes care of wireless transmission. GPS Sync unit also an IP67 Complied which distributes 1PPS clock to the ODU's, maximum of Six ODU's.

Radio Modem Type-A unit can work in the following configurations:

- Normal (1 + 0) configuration
- Standby (1 + 1) configuration

In Standby configuration it supports IDU, ODU & Antenna level Redundancy.

Units of the System (Per Hop):

- Two IDUs (1+0) / Four IDUs (1+1)
- Two ODUs (1+0) / Four ODUs (1+1)
- Two GPS sync unit (1+0) / (1+1)
- Zero Passive Splitter (1+0) / Two Passive Splitter (1+1)
- Two Antennas (1+0) / Four Antennas (1+1)

TECHNICAL SPECIFICATIONS:

RF Air-Interface Specifications	
Throughput	Multiple Options 100 Mbps, 50 Mbps, 10 Mbps
Range	Depends as per Throughput and Receiver Sensitivity Achieved
Frequency	5.8 GHz (Range 5825 - 5875 MHz) unlicensed band
Maximum Power Output (EIRP)	36 dBm including Antenna Gain
Channel Bandwidth	Configurable: 5, 10, 20, 40 MHz
Radio Access scheme	OFDM, Supports MIMO 2x2
Adaptive Modulation & Coding	BPSK/QPSK/QAM16/QAM64
End to End Latency	20 msec
Duplex Technology	TDD
Antenna Type	External or Integrated

Spectrum Viewer	Optional
Redundancy	1+1 at ODU Level, Both IDU+ODU level using Passive Splitter.
E1 Service Specifications	
Protocols	G.703, G.704, G.783, G.784
E1 Interface	Up-to 8 ports for G.703/G.704 Complied, E1 (2.048 Mbps) interface on RJ45 Connector
E1 Clocking scheme	Internal, Adaptive, Loop Timing
E1 data types	Framed, Unframed, Synchronous, Asynchronous
E1 Redundancy	1+1 Redundancy with Passive Splitter
Ethernet Service Specifications	
Ethernet Interface	Up to 5 ports (2 Ports for 10/100 Mbps Data), (1 Port for Management), (2 for PoE/uplink)
Sub convergence layer	Layer 2
Quality of Service (QoS)	Packet classification to 4 queues according to 802.1p and TOS/DSCP, Strict Priority
Virtual LAN (VLAN)	802.1Q, Q-in-Q, 4094 VLAN's
Protection support	STP
Synchronization	Synchronous Ethernet (SyncE), IEEE 1588v2 (PTP)
Passive Splitter Specifications	
Type	Passive
E1 Port Support	Up-to 8 ports (RJ45 connector type)
EMS Specifications	
Management Application	GUI & Web based Management
Protocol	SNMPv1, SNMPv2, Telnet, HTTP, IPv4
EMS Application	Customized EMS or integration with 3rd party NMS System via Standard MIB's
LED's/Alarms	
E1 LED's	LOS/LOF, Far End, Packet Loss
Ethernet LED's	Link-up, Packet Activity
IDU System LED's	Power, P'SR, ODU, F'nd Lnk, Mst/Slv, Pri/Sec, P'ST, R'VD, FWR
ODU System LED's	Power, Ethernet, AIR interface, RSSI CH-0 & CH-1
GPS Sync unit LED's	GPS Reference Clock, Power, 1PPS/TOD
Hardware Specifications	
Power Option	IDU : AC 230V, 3A and DC -48V, 2A ODU: DC 48V, 0.5A, PoE ports (IEEE 802.11af Complied) GPS sync unit: DC 48V, 0.3A
Power Consumption	<15W (per IDU/ODU)
Operating Temperatures	IDU: -10°C to + 60°C, QM-333, Category-B2 Complied ODU/GPS Sync unit: -15°C to + 60°C, QM-333, Category-D Complied
Humidity	5 % to 95 %, QM-333, Category-D Complied
IDU Size	19" 1U Chassis – 440 x 160 x 44 mm
ODU Size	IP67 Complied - 274 x 173 x 66 mm
GPS Sync unit size	IP67 Complied - 274 x 173 x 66 mm
Passive Splitter Size	19" 1U Chassis – 440 x 160 x 44 mm
Certifications/Compliance	

Environmental	ODU and GPS Sync unit: QM333, Category-D, QM-301 and IP67 Complied IDU: QM333, Category-B2,QM-301 Complied
EMC/EMI	CISPR 22 (2005), IEC 61000-4-2 (2001), IEC 61000-4-3 (2006), IEC 61000-4-4 (2004), IEC 61000-4-5 (2005), IEC 61000-4-6 (2003), IEC 61000-4-11
Safety	IEC 60950-1 (2005), IEC 61000-4-2 (2001)
Radio Regulations	G.S.R 38 (E) Dated 19 January 2007 Notification
Quality Management & Environmental Management	ISO 9001:2015 & ISO 14001:2015
TEC Specifications	TEC/GR/R/ISM-MOD-001/04.MAR 2016
Hardware Ordering Options	
E1 Number of Ports	8 ports
Redundancy Configuration	1+1 (Redundancy at ODU level and at IDU level with Passive Splitter)
PoE Type	Internal to IDU, External to ODU
Power Supply Options	AC 230V,3A and DC -48V, 2A
Synchronization Support	Yes
Antenna Option	External or Integrated
ODU/GPS Sync unit Mechanical	IP67 Complied

Antenna -Electrical Parameters	
Frequency	4900-5900 MHz
Gain (dBi) (Minimum)	2 x 26±0.5
VSWR (Max)	1.5:1
V Plane BW (deg)	9 +/- 0.5
H plane BW (deg)	9 +/- 0.5
Polarization	Dual (Linear H & V)
Port to Port isolation (dB)	>30
Maximum Power input (watts)	50
Impedance	50 Ohm
Front to back ratio (dB)	> 30
Cross Polarization (dB)	> 22
Connector Termination	2 x N(F) or Customized
Lightning Protection	DC Ground

Antenna- Mechanical Parameters	
Dimension (mm)	Ø 450
Antenna Material	Aluminium Alloy
Gross Weight (Kg)	3.5
Packing Dimension (inch)	20 X 20 X 8
Mounting Hardware	MS Galvanized & Powder coated
Mounting Style	Tower and Pole
Mounting Pole Diameter (inch)	2
Mounting Adjustment	H Plane +/- 180-degree V Plane +/- 15 degree
Antenna-Environmental Parameters	
Temperature Range (°C)	-40 to + 70
Maximum Wind Speed Capability (Km/Hr)	200
Humidity	95 % No Condensation

Table-1

Receiver Sensitivity (dBm)								
Channel Bandwidth (MHz)	MCS Index							
	0	1	2	3	4	5	6	7
5	-95	-94	-93	-91	-87	-85	-82	-79
10	-95	-94	-90	-88	-85	-82	-79	-78
20	-92	-90	-86	-85	-78	-76	-75	-73
40	-90	-89	-84	-81	-79	-76	-75	-72

Table-2

E1 + Ethernet Throughput											
40 (MHz) Bandwidth			20 (MHz) Bandwidth			10 (MHz) Bandwidth			5 (MHz) Bandwidth		
MCS Index	E1 + Ethernet traffic TX (Mbps)	Overall Throughput observed in LCT (Mbps)	MCS Index	E1 + Ethernet traffic TX (Mbps)	Overall Throughput observed in LCT (Mbps)	MCS Index	E1 + Ethernet traffic TX (Mbps)	Overall Throughput observed in LCT (Mbps)	MCS Index	E1 + Ethernet traffic TX (Mbps)	Overall Throughput observed in LCT (Mbps)
4	8E1+20	54.3	5	8E1+16	40.44	5	4E1+3	20.31	5	2E1+0	8.62
5	8E1+35	69.26	6	8E1+10	44.41	6	4E1+4	21.21	6	2E1+0	8.63
6	8E1+40	74.22	7	8E1+14	48.41	7	4E1+7	24.2	7	2E1+1	9.59
7	8E1+42	76.22	3	4E1+3	20.22	3	2E1+1	9.62	4	1E1+1	5.3
1	4E1+3	20.18	4	4E1+11	28.16	4	2E1+5	13.58	5	1E1+2	6.3
2	4E1+11	28.02	5	4E1+19	36.11	5	2E1+9	17.54	6	1E1+4	8.29
3	4E1+20	37.02	6	4E1+23	40	6	2E1+12	20.52	7	1E1+4.5	8.77

4	4E1+36	52.9	7	4E1+27	44	7	2E1+14	22.51			
5	4E1+50	66.77	1	2E1+2	10.63	1	1E1+0.5	4.8			
6	4E1+56	72.75	2	2E1+5	13.57	2	1E1 +2	6.29			
7	4E1+62	78.57	3	2E1+9	17.57	3	1E1 +5	9.25			
0	2E1+2	10.59	4	2E1+19	27.44	4	1E1 +9	13.24			
1	2E1+9	17.53	5	2E1+27	35.38	5	1E1 +13	17.18			
2	2E1+19	27.44	6	2E1+31	39.34	6	1E1 +15	19.17			
3	2E1+29	37.32	7	2E1+35	45.26	7	1E1 +18	22.18			
4	2E1+46	54.17	0	1E +0.5	4.8						
5	2E1+63	70.95	1	1E1 +5	9.26						
6	2E1+71	78.94	2	1E1 +9	13.2						
7	2E1+72	79.92	3	1E1 +15	19.17						
0	1E1 +6	10.24	4	1E1 +24	28.03						
1	1E +12	16.19	5	1E1 +30	34.03						
2	1E +23	27.09	6	1E1 +36	39.96						
3	1E +30	34.02	7	1E1 +43	46.91						
4	1E +48	51.84									
5	1E1+68	71.67									
6	1E1+74	77.62									
7	1E1+75	78.6									

Table-3

Inputs (for Maximum Distance Calculations)								
Frequency (MHz)	Tx Power (dBm)	Tx Antenna Gain (dBi)	EIRP (dBm)	Rx Antenna Gain (dBi)	Link Margin	Propagation Loss Index		
5845	10	26	36	26	10	2		
Maximum Feasible Distance (Km)								
Bandwidth (MHz)	MCS Index							
	0	1	2	3	4	5	6	7
5	50	44	39	25	18	10	10	3
10	42	35	25	20	12	8	6	3
20	30	24	18	13	8	4	2	2
40	28	20	16	11	7	4	4	2

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