

RADIO MODEM (TYPE-B) (DE700402/A5)



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-B (DE700402/A5) is a data communication device for the Indian Telecommunication Network, and the system will work 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. 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 25km. Please refer Table-4 for maximum feasible LOS distance for working.

FEATURES:

- 10/100 Mbps Ethernet Ports and 1000 Mbps POE ports
- Ethernet Capacity 10 Mbps/50 Mbps/100 Mbps/200 Mbps
- Supported Channel Bandwidth – 5,10,20,40 MHz
- Supported Adaptive Coding and Modulation (ACM)
- Supported OFDM
- Inbuilt POE
- Supported Frequency Band – 5.8 GHz (5825 - 5875 MHz)
- Duplexing Mode- TDD
- QoS and VLAN capabilities
- Supported IEEE 802.3 and IEEE 802.1Q
- Supported Protocol- IEEE 802.1ad (Q-in-Q)
- Supported IEEE 1588v2 (PTP) and Sync
- Supported 1+1 Redundancy only at ODU level
- Supported Dying Gasp and SPV alarms
- Fully IP67 Compliant including ODU switch, ODU and GPS Sync unit
- Complied to TEC GR: TEC/GR/R/ISM-MOD-001/04.MAR 2016.



**ODU
(DE700405)**



**ODU Switch
(DE700409)**



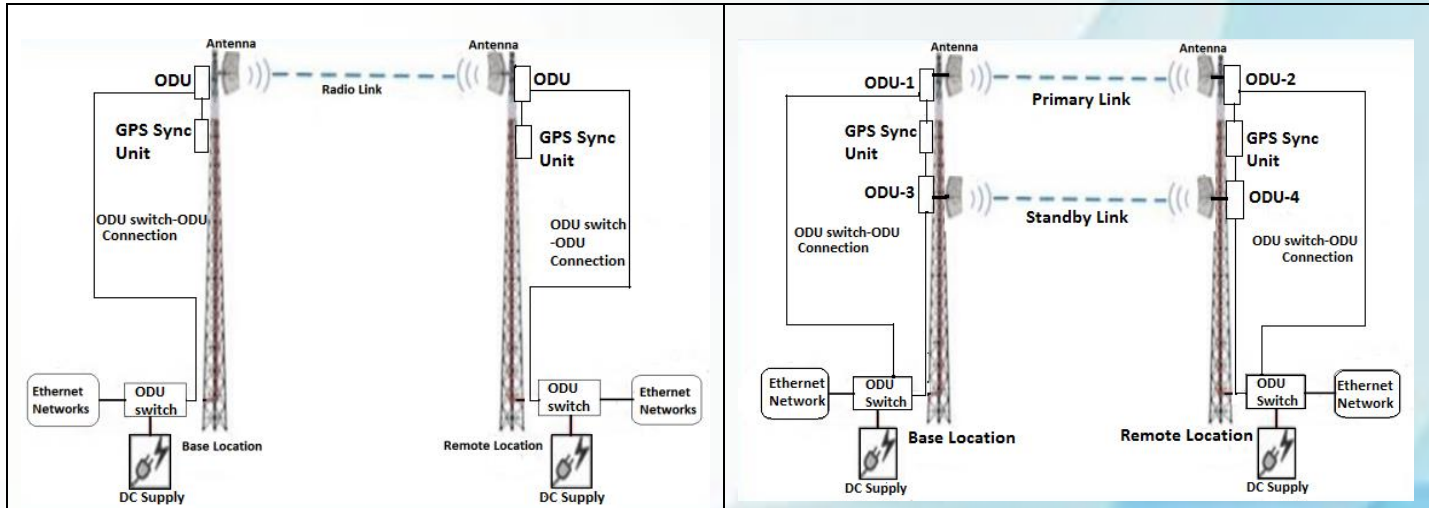
**GPS Sync Unit
(DE700410)**



**Antenna
(DE528569)**

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-B is a split type fully outdoor unit, it includes an Outdoor Switch unit (DE700409), Outdoor unit (ODU-DE700405) and GPS Sync unit (DE700410). Outdoor Switch unit is an IP67 complied unit and it takes the pure Ethernet traffic as an input and send them into ODU over PoE interface. ODU unit is an IP67 complied unit which takes care of wireless transmission. If required ODU switch unit can be mounted indoor as well with the help of specialized brackets. GPS Sync unit also an IP67 Compliant unit, which distributes 1PPS clock to the ODU's, maximum of six ODU's.

Radio Modem unit can work in the following Configuration:

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

In Standby configuration it's support ODU/Antenna level Redundancy.

ODU unit is having 2 RF Channels which can be connected with dual polarized Antenna.

Units of the system (Per Hop):

- Two ODU switch's (1+0) / (1+1)
- Two ODU's (1+0) / Four ODUs(1+1)
- Two GPS Sync unit (1+0) / (1+1)
- Two Antennas (1+0) / Four Antennas (1+1)

TECHNICAL SPECIFICATIONS:

RF Air-Interface Specifications	
Throughput	Multiple Options 200 Mbps, 100 Mbps, 50 Mbps, 10 Mbps
Range	Depends on Throughput and Receiver Sensitivity Achieved
Frequency Band	5.8 GHz (5825 to 5875 MHz) unlicensed band
Maximum Power Output (EIRP)	36 dBm including Antenna Gain
Channel Bandwidth	5, 10, 20, 40 MHz
Radio Access scheme	OFDM, 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 Redundancy only at ODU Level
Ethernet Service Specifications	
Ethernet Interface	Up-to 6 ports (ports 1,2,4,5 for 10/100 Mbps Data), 2 PoE ports (port 3 & 6) for 1 Gbps Data.
Sub Convergence layer	Layer 2
Quality of Service (QoS)	Packet classifications to 4 queues according to 802.1p and TOS/DSCP Priority
Virtual LAN (VLAN)	802.1Q, Q-in-Q, 4094 VLAN's
Synchronization	Synchronous Ethernet (SyncE), IEEE 1588v2 (PTP)
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	
Ethernet LED's	Link-up, Packet Activity
ODU Switch System LED's	Ethernet Port, Power, ODU, AIR I/F
ODU System LED's	Power, Ethernet, AIR interface, Site, RSSI CH-0 & CH-1
GPS Sync unit LED's	GPS Reference Clock, Power, 1PPS/TOD
Hardware Specifications	
Power Option	ODU Switch (Outdoor IP67): Only DC 48V, 2A (Range 36V -75V) ODU : DC 48V, 0.5A , PoE (IEEE 802.11af Complied) GPS Sync unit: DC 48V, 0.3A
Power Consumption	<15W (per ODU switch/ODU)
Operating Temperatures	-15°C to + 60°C, QM-333, Category-D Complied
Humidity	5 % to 95 %, QM-333, Category-D Complied
ODU Switch size	IP67 Complied – 274 x 173 x 66 mm
ODU size	IP67 Complied – 274 x 173 x 66 mm
GPS Sync unit size	IP67 Complied – 274 x 173 x 66 mm
Certifications/Compliance	
Environmental	QM333, Category-D, QM-301 and IP67 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 € 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	
Ethernet Number of Ports	6 Ports (Ports 3 & 6 --- POE/1 Gigabit Ethernet) (Port 1,2,4,5 --- 10/100 Mbps Fast Ethernet)

Redundancy Configuration	1+0 (No Redundancy) or 1+1 (ODU level Redundancy)
PoE Type	Internal to ODU Switch, External to ODU
Power Supply Options	Only DC -48V,2A
Antenna Option	External or Integrated
ODU,ODU Switch, GPS Sync unit Mechanical	IP67 Complied
SyncE & PTP	Yes

Antenna -Electrical Parameters	
Frequency	4900-5900 MHz
Gain (dBi) (Minimum)	H=23.5 +/- 0.5 , V=23.5 +/- 0.5
VSWR (Max)	1.5:1
V Plane BW (deg)	7 +/- 0.5
H plane BW (deg)	7 +/- 0.5
Polarization	Dual (Linear H & V)
Port to Port isolation (dB)	25
Maximum Power Input (watts)	50
Impedance	50 Ohm
Front to back ratio (dB)	> 26
Cross polarization (dB)	> 28
Antenna- Mechanical Parameters	
Radome	UV Stabilized ABS/UV Protected Polycarbonate
Mounting Hardware	MS galvanized powder coated
Mounting Style	Tower, Pole and Wall
Mounting Adjustment	H Plane +/- 180-degree V Plane +/- 180 degree
Antenna-Environmental Parameters	
Temperature Range (°C)	-10 to +65 (Snow bound areas -40 to +65)
Maximum Wind Speed Capability (Km/Hr)	196
Humidity	95 % No Condensation
Vibration	QM333, Category D, Complied
Water Protection	IP67 Complied
Environmental Protection	QM333, Category D, Complied

Table-1

Ethernet Throughput					
MCS Index	Modulation and FEC	Unidirectional Ethernet Throughput (Mbps)			
		Bandwidth 5 (MHz)	Bandwidth 10 (MHz)	Bandwidth 20 (MHz)	Bandwidth 40 (MHz)
0	BPSK-1/2	1	2	5	11
1	QPSK-1/2	2	5	11	23
2	QPSK-3/4	4	8	16	34
3	16QAM-1/2	5	11	22	46
4	16QAM-3/4	8	16	33	68
5	64QAM-2/3	11	22	44	89
6	64QAM-3/4	12	24	50	97
7	64QAM-5/6	13	27	55	98
8	BPSK-1/2	2	4	10	22
9	QPSK-1/2	4	11	22	44
10	QPSK-3/4	7	17	33	68
11	16QAM-1/2	11	22	44	88
12	16QAM-3/4	16	34	66	118
13	64QAM-2/3	22	41	86	156
14	64QAM-3/4	24	49	96	178
15	64QAM-5/6	27	55	98	180

Table-2

Receiver Sensitivity Observed (dBm)																
Bandwidth (MHz)	MCS Index															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5	-95	-94	-93	-91	-87	-85	-82	-79	-95	-94	-92	-90	-86	-84	-81	-78
10	-95	-94	-90	-88	-85	-82	-79	-78	-94	-93	-89	-87	-85	-81	-78	-76
20	-91	-91	-85	-85	-81	-78	-76	-73	-91	-88	-87	-85	-81	-79	-76	-74
40	-89	-87	-85	-81	-79	-76	-73	-70	-90	-87	-83	-81	-79	-73	-73	-72

Table-3

Transmit Power Observed (for 10 dBm)																
Bandwidth (MHz)	MCS Index															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5	9.79	9.67	9.61	9.72	9.66	9.67	9.7	7.54	9.79	9.67	9.61	9.72	9.66	9.67	9.7	7.54
10	9.33	9.6	9.74	9.75	9.69	9.76	9.79	7.03	9.33	9.6	9.74	9.75	9.69	9.76	9.79	7.03

20	9.43	9.23	9.12	9.01	9.11	9.04	9.05	7.05	9.43	9.23	9.12	9.01	9.11	9.04	9.05	7.05
40	9.74	9.71	9.7	9.76	9.68	9.7	9.72	6.43	9.74	9.71	9.7	9.76	9.68	9.7	9.72	6.43

Table-4

Inputs (for Maximum Distance Calculations)						
RF Frequency (MHz)	Tx Power (dBm)	Tx Antenna Gain (dBi)	EIRP (dBm)	Rx Antenna Gain (dBi)	Link Margin	Propagation Loss Index
5845	13	23	36	23	10	2

Maximum Feasible Distance (Km)																
Band width (MHz)	MCS Index															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5	25	22	20	13	9	5	5	2	25	18	12	9	6	3	3	1
10	21	17	13	10	6	4	3	1	17	11	8	6	4	3	2	1
20	15	12	9	6	4	2	1	1	12	8	6	4	3	2	1	1
40	14	10	8	6	4	2	2	1	11	8	5	3	1	1	1	1

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