Digital Microwave Radio Relay System Series B

IMTEL INSTITUT

Key features:

- E1 G.703 interfaces at 2.048 Mbit/s
- V.35 interfaces from 320 kbit/s up to 8.6 Mbit/s
- capacity independent ODU
- frequency independent IDU
- software capacity configuration
- software selection of output power
- software selection of operating frequency
- remote and local base band loop tests
- microwave loop tests
- voice service channel
- external alarms and control
- RRUNET NMS with network topology

Key applications:

- Fixed telephony switching systems, remote subscribers block and remote subscribers interconnection
- Mobile communication systems base stations, base station controllers and switching systems interconnection
- LAN and WAN inter connection
- Wireless Internet access
- Last mile access
- Digitalized TV transmission (MPEG2)
- Remote control, alarms & security systems
- Fiber optics back up

Radio tower located near Gračanica
All Radio Units are by Institute IMTEL (pictured in May, 2005)

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TECHNICAL DATA

General

Frequency Band (GHz)	2.5	7	13	15	18	23	26
Frequency plan ITU-R*	F.283-3	F.385-7	F.497-6	F.636-3	F.585-8	F.637-3	F.787-4
(*) - other frequency plan can be installed on user demand							
Tx-Rx spacing (MHz)	119	161	266	490/728	1010	1008	1008
ETSI standard (EN or ETS)	300 633	301 216	301 128	301 128	301 128	300 198	300 431
Sub-band width (MHz)	28	56	56	56	110	112	112

Capacity	4x2 Mbit/s	8x2 Mbit/s	16x2 Mbit/s
Link net bit rate	8.832 Mbit/s	17.664 Mbit/s	35.328 Mbit/s
Wayside data traffic	320 kbit/s	749 kbit/s	1.605 Mbit/s
Modulation type	O-QPSK	O-QPSK	O-QPSK
Channel spacing	7 MHz	14 MHz	28 MHz
Concept	Split - mount (IDU-ODU), or all outdoor with sealed container for IDU		
Protection modes	1+0, 1+1 hot standby and 1+1 frequency diversity		
IF bandwidth	28MHz (each IDU capacity could be used with each ODU)		

Transmitter

Frequency Band (GHz)		2.5	7	13	15	18	23	26
Output power (dBm)	standard	25	25	20	20	20	18	15
	high	33	30	30	25	-	-	-
Output power selection		by 0 to 30dB software selectable attenuator						
Output power measuring accuracy		2dB in the whole temperature range						
Tx frequency stability		±10 ppm	±10 ppm	±10 ppm	±10 ppm	±10 ppm	±15 ppm	±15 ppm
Frequency selection		Software with 50kHz step						

Receiver

Frequency Band (GHz)		2.5	7	13	15	18	23	26
Noise figure		3	3	4.5	4.5	5	5	7
Receiver threshold for BER=10e-3 4x2/8x2/16x2 (dBm)		-88/-85/-83	-88/-85/-83	-87/-84/-82	-87/-84/-82	-87/-84/-81	-87/-84/-81	-85/-82/-80
Receiver threshold for BER=10e-3 4x2/8x2/16x2 (dBm)		-84/-81/-79	-84/-81/-79	-83/-80/-78	-83/-80/-78	-83/-80/-78	-83/-80/-78	-82/-79/-77
LO stability		10 ppm						
Receiving signal input range		from -90 to -20dBm						
Receiving signal measuring accuracy		2dB in the whole temperature range						
Capacity			4x2Mbit/s	8x2Mbit/s			16x2Mbit/s	
Residual BER			<10e-10	<10e-10			<10e-11	
Signature width (MHz)	MF, for BER=10e-3		6.4	14.8			24.7	
	MF, for BER=10e-6		6.4	14.8			26.7	
	NMF, for BER=10e-3		7.1	15.2			23.0	
	NMF, for BER=10e-6		7.1	15.2			24.8	
Signature hight (dBm)	MF, for BER=10e-3		32	30			18.2	
	MF, for BER=10e-6		32	30			16.8	
	NMF, for BER=10e-3		32	30			15.4	
	NMF, for BER=10e-6		32	30			15.1	

Antennas

Diameter (m)	Frequency Band (GHz)	2.5	7	13	15	18	23	26
0.3	Gain (dBi)	-	-	-	-	32.0	34.2	35.2
	Radome loss (dB)	-	-	-	-	1.5	2	2.5
0.7	Gain (dBi)	-	-	35.2	36.5	38.3	40.3	41.4
	Radome loss (dB)	-	-	1.2	1.5	1.5	2	2.5
0.9	Gain (dBi)	-	32.5	38.0	39.2	41.0	-	-
	Radome loss (dB)	-	1	1.2	1.5	1.5	-	-
1.2	Gain (dBi)	27.0	36.0	40.6	42.5	43.9	-	-
	Radome loss (dB)	1	1	1.2	1.5	1.5	-	-

IDU-ODU cables

IDU⇒ODU IF frequencies	390 / 140 MHz
Maximum allowed IDU-ODU cable loss	25 dB
Minimum ODU DC voltage	24V

Type	Outer diameter	Attenuation at 140 MHz	Attenuation at 390 MHz	DC Loop resistance	IDU-ODU distance
WBC-400R	10.4 mm	4.5 dB/100m	8.1 dB/100m	1.1 /100m	300 m
RG 214	10.8 mm	8.2 dB/100m	13.2 dB/100m	0.95 /100m	190 m
RG 58	5.0 mm	20 dB/100m	36 dB/100m	5.3 /100m	70 m

Interfaces

E1	Bit rate		2.048Mbit/s
	Interface specification (bit rate tolerances,pulse shape,reflection, cable attenuation)		according to ITU-T G.703
	Jitter specification		according to ITU-T G.823
	Port type		symmetrical Zc=120 Ω
	Connector type		DB25 female for each 4 tributaries
V.35	Bit rate		from 320kbit/s to 8.6Mbit/s
	Operating mode		DCE
	Clock pulse width	standard mode	50-60ns with pauses
		safe 2Mbit/s mode	219-269ns continuos
	Allowed latency from DCE transmit clock to DTE transmit data transition	standard mode	20 to 80 ns
		safe 2Mbit/s mode	not critical due to continuos clock
	Hand shaking signals RTS, CTS, DSR, ACCM		no needed
	Number of V.35 interfaces (4x2/8x2/16x2)		1/2/2
	Connector type		DB25

Note: Data are subject to change without notice

TECHNICAL DATA (continued)

Service channels, external alarms and control

Number of voice service channels	1
Voice coding	A-low 64kbit/s PCM
Analogue interface	4 wires
Signal level selection	software 1dB step (0.1dB optionaly)
Call signal	omnibus/single via RRUNET
Cascading type	omnibus, at analogue signal level
Number of external alarms (4x2/8x2/16x2)	1/3/3
Coupling method	optocoupled
Number of external controls	1
Coupling method	optocoupled
Alarm and control refresh rate	10Hz

RRUNET Network Management System (NMS)

NMS hardware included in each IDU	
RRU Net access connector	RJ45
Single hop functions	-Operating frequency selection
	-Output power selection
	-Receiving signal level monitoring
	-Pseudo BER monitoring
	-Alarms inspection
	-Traffic configuration between E1 and V.35 interfaces
	-Remote and local base band loop tests setting
	-Microwave loop tests setting
	-Long term monitoring
NMS networking	-Star topology via RS232 interconnections
	-Gateways via leased or switched line modems, GSM modems or SNMP Ethernet
	-Autodetection of network tree
	-Alarm massages
	-Data tunneling at RS232 level
NMS workstation	PC with Windows 98/ME/2000/XP operating system

Power supply

Input voltage range	from 24 to 72 V DC
Power consumption	1+0 30W 1+1 50W
Optional PSU	220V/ 50Hz

MTBF

1+0 terminal MTBF (one IDU, one ODU)	11 years
1+1 terminal MTBF (one IDU with switch, two ODUs of which at least one should be operational)	17 years

Mechanical and environmental

Unit	IDU	IDU outdoor container	ODU
Dimensions (mm)	430 x 260 x 45 (4x2 and 8x2) 430 x 260 x 90 (16x2)	520 x 360 x 270	300 x 300 x 220
Weight (kg)	2.6 (4x2 and 8x2) 3.2 (16x2)	12 kg	5.6 (standard power) 6.8 (high power)
Temperature range	from -35 to +60C	from -35 to +60C	from -35 to +60C
Relative humidity	from 0 to 90% non condensing	from 0 to 99.8%	from 0 to 99.8%
Rain	not sealed (outdoor container needed)	according ITU-T K.20	according ITU-T K.20
Overvoltage protection	according ITU-T K.20	according ITU-T K.20	according ITU-T K.20
Wind load	-	up to 200km/h	up to 200km/h

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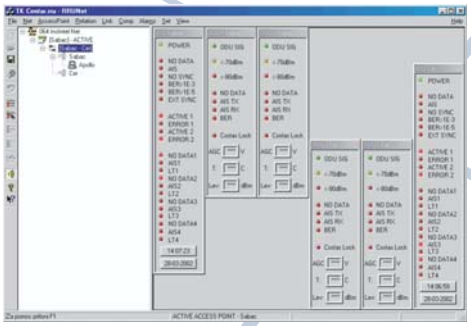
InDoor Unit 4x2 Mbit/s

InDoor Unit 8x2 Mbit/s

InDoor Unit 16x2 Mbit/s



RRUNET Network Management System

OutDoor Unit with Antenna

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