D-10 TECHNICAL INFORMATION

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List of RRI Radio Stations

	STATION	No.	LOCATION	TX	TX	MAKER	INST.	POWER(kW)	STAR. OP.	BAND	FREQUENCY(MHz)	REMARKS
1	JAKARTA	1	CIMANGGIS 1	1	TX1	HARRIS	1982	100	1982	SW	9.68	
2	JAKARTA	1	CIMANGGIS 1	2	TX2	HARRIS	1982	100	1982	SW	7.27	
3	JAKARTA	1	CIMANGGIS 1	3	TX3	HARRIS	1982	100	1982	SW	11.77	
4	JAKARTA	1	CIMANGGIS 1	4	TX4	TELEFUNKEN	1965	100	1965	SW	9.78	FOR STAND BY TX 1 & 2
5	JAKARTA	1	CIMANGGIS 1	5	TX5	PHILIPS	1969	120	1969	SW	6.045	
6	JAKARTA	1	CIMANGGIS 1	6	TX6	PHILIPS	1969	50	1969	SW	6.045	FOR STAND BY TX 5
7	JAKARTA	1	CIMANGGIS 1	7	TX7	PHILIPS	1969	50	1969	SW	4.775	FORMERLY SPECIAL PRO.
8	JAKARTA	2	CIMANGGIS 2	1	TX1	NEC	1976	150	1976	MW	0.999	COMBINED WITH TX 2
9	JAKARTA	2	CIMANGGIS 2	2	TX2	NEC	1976	150	1976	MW	0.999	COMBINED WITH TX 1
10	JAKARTA	2	CIMANGGIS 2	3	TX3	VEB-FUNKWER	1973	100	1973	SW	11.79	
11	JAKARTA	2	CIMANGGIS 2	4	TX4	VEB-FUNKWER	1973	100	1974	SW	15.15	
12	JAKARTA	2	CIMANGGIS 2	5	TX5	THOMSON	1984	250	1984	SW	11.865	
13	JAKARTA	3	KEBAYORAN BARU	1	FM1	GATES	1976	10	1976	VHF	105	FORMERLY MUSICAL PRO.
14	JAKARTA	3	KEBAYORAN BARU	2	STL1	MARTI	1980	0.03	1980	UHF	890	STL MDK.BARAT-KBY.
15	JAKARTA	3	KEBAYORAN BARU	3	TX1	RCA	1953	7.5	1953	SW	3.275	FORMERLY SPECIAL PRO.
16	JAKARTA	3	KEBAYORAN BARU	4	TX2	AWA	1958	2.5	1958	SW	2.305	
17	JAKARTA	3	KEBAYORAN BARU	5	TX3	GATES	1973	1	1975	MW	1.215	FORMERLY MUSICAL PRO.
18	JAKARTA	3	KEBAYORAN BARU	6	TX4	RRI		1	1982	MW	1.215	
19	JAKARTA	3	KEBAYORAN BARU	7	TX5	GATES	1973	10	1971	MW	1.332	
20	JAKARTA	3	KEBAYORAN BARU	8	TX8	RRI	1982	1	1982	MW	1.332	INTERCHANGE WITH TX 5
21	JAKARTA	4	STUDIO	1	FM1	PHILIPS	1970	0.05	1974	VHF	100	
22	JAKARTA	4	STUDIO	2	FM2	PHILIPS	1970	0.05	1974	VHF	104	
23	JAKARTA	4	STUDIO	3	FM3	TELEFUNKEN	1970	0.3	1976	VHF	93	
24	JAKARTA	4	STUDIO	4	FM4	TELEFUNKEN	1970	0.3	1976	VHF	93	
25	JAKARTA	5	STUDIO	5	FM5	PHILIPS	1970	0.05	1981	VHF	103	
26	JAKARTA	6	STUDIO	6	FM6	PHILIPS	1970	0.05	1974	VHF	107	
27	JAKARTA	7	STUDIO	7	STL1	NEC	1980	0.003	1980	UHF	949	OTHER FREQ.:956MHz
28	MEDANN	1	PADANG CERMIN	1	TX1	TOSHIBA	1976	50	1976	MW	0.855	
29	MEDANN	1	PADANG CERMIN	2	TX2	TOSHIBA	1976	50	1976	MW	0.855	
30	MEDANN	1	PADANG CERMIN	3	TX3	THOMSON	1987	250	1988	SW		
31	MEDANN	2	SEI SEMAYANG	1	TX1	GATES	1951	1	1954	MW	0.819	
32	MEDANN	2	SEI SEMAYANG	2	TX2	RRI		1	1984	MW	0.801	
33	MEDANN	2	SEI SEMAYANG	3	TX3	RRI		0.5	1983	MW	0.801	
34	MEDANN	2	SEI SEMAYANG	4	TX4	PHILIPS	1970	50	1970	SW	4.765	
35	MEDANN	2	SEI SEMAYANG	5	TX5	GATES	1955	20	1955	SW	3.375	
36	MEDANN	2	SEI SEMAYANG	6	TX6	RCA	1953	7.5	1953	SW	3.375	
37	MEDANN	3	STUDIO	1	FM1	LEN	1980	0.05	1981	VHF	105	ALSO AS STL
38	MEDANN	3	STUDIO	2	FM2	NEC	1979	0.15	1979	VHF	88	ALSO AS STL
39	MEDANN	3	STUDIO	3	STL1	NEC	1976	0.003	1976	UHF	956	OTHER FREQ.:949MHz
40	MEDANN	3	STUDIO	4	FM3	PHILIPS	1970	0.05	1970	VHF	103	ALSO AS STL
41	YOGYAKARTA	1	DEMANGAN	1	TX1	TCA	1958	1	1961	MW	1.07	INTERCHANGE WITH TX 4 SETURAN
42	YOGYAKARTA	2	SETURAN	1	TX1	PHILIPS	1971	0.05	1971	SW	7.19	
43	YOGYAKARTA	2	SETURAN	2	TX2	GATES	1954	20	1954	SW	5.045	FRIDAY FREE
44	YOGYAKARTA	2	SETURAN	3	TX3	RCA	1954	7.5	1954	SW	7.1	TUBE CHANGED WITH ORIGINAL
45	YOGYAKARTA	2	SETURAN	4	TX4	HARRIS	1976	10	1976	MW	1.107	FRIDAY:0000-1000
46	YOGYAKARTA	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	107	FRIDAY FREE
47	YOGYAKARTA	3	STUDIO	2	FM2	PHILIPS	1970	0.05	1971	VHF	103	FRIDAY FREE
48	YOGYAKARTA	3	STUDIO	3	FM3	LEN	1983	0.05	1984	VHF	101	
49	BANJARMASIN	1	SUNGAI TABUK	1	TX1	NEC	1976	25	1977	MW	1.134	TRANSFORMER MODULATOR DAMEGED
50	BANJARMASIN	1	SUNGAI TABUK	2	TX2	NEC	1978	25	1977	MW	1.134	TRANSFORMER MODULATOR DAMEGED
51	BANJARMASIN	1	SUNGAI TABUK	3	TX3	GATES	1958	20	1975	SW	3.25	
52	BANJARMASIN	1	SUNGAI TABUK	4	TX4	GATES	1958	10	1958	SW	5.97	
53	BANJARMASIN	1	SUNGAI TABUK	5	TX5	GATES	1952	1	1955	MW	1.134	
54	BANJARMASIN	1	SUNGAI TABUK	6	TX8	RRI	1975	0.15	1975	MW	0.785	
55	BANJARMASIN	1	SUNGAI TABUK	7	TX7	RRI	1981	0.25	1981	SW	2.43	
56	BANJARMASIN	2	STUDIO	1	FM1	LEN	1982	0.05	1982	VHF	105	
57	BANJARMASIN	2	STUDIO	2	FM2	LEN	1983	0.05	1983	VHF	97.6	
58	BANJARMASIN	2	STUDIO	3	FM3	NEC	1979	0.15	1979	VHF	97.8	NOT AVAILABLE SPARE PARTS

	STATION	No.	LOCATION	TX	TX	MAKER	INST.	POWER(kW)	STAR. OP.	BAND	FREQUENCY(MHz)	REMARKS
59	BANJARMASIN	2	STUDIO	4	STL1	NEC	1976	0.003	1977	UHF	949	OTHER FREQ.:956MHz
60	UJUNG PANDANG	1	BONTOSUNGGU	1	TX1	PTT	1942	2	1950	SW	2.49	
61	UJUNG PANDANG	1	BONTOSUNGGU	2	TX2	TCA	1962	7.5	1964	SW	9.55	
62	UJUNG PANDANG	1	BONTOSUNGGU	3	TX3	GATES	1954	20	1958	SW	4.75	
63	UJUNG PANDANG	1	BONTOSUNGGU	4	TX4	TOSHIBA	1976	50	1977	MW	0.63	INTERCHANGE WITH TX 5
64	UJUNG PANDANG	1	BONTOSUNGGU	5	TX5	TOSHIBA	1976	50	1977	MW	0.63	INTERCHANGE WITH TX 4
65	UJUNG PANDANG	2	JONGAYA	1	TX1	PHILIPS	1968	50	1971	SW	4.72	MONITORED BY JAKARTA
66	UJUNG PANDANG	3	STUDIO	1	FM1	NEC	1978	0.15	1979	VHF	97.6	ALSO AS STL
67	UJUNG PANDANG	3	STUDIO	2	FM2	LEN	1979	0.05	1980	VHF	97.8	
68	UJUNG PANDANG	3	STUDIO	3	STL1	NEC	1976	0.003	1977	UHF	949	OTHER FREQ.:956MHz
69	UJUNG PANDANG	3	STUDIO	4	TX1	PHILIPS	1942	0.5	1950	SW	3.214	
70	UJUNG PANDANG	3	STUDIO	5	FM3	BAY ELECTRIC	1977	0.05	1978	VHF	104	ON AIR ONLY INCIDENTAL
71	JAYAPURA	1	SKY LINE	1	TX1	HARRIS	1974	10	1977	MW	1.053	
72	JAYAPURA	1	SKY LINE	2	TX2	GATES	1968	20	1971	SW	8.07	
73	JAYAPURA	1	SKY LINE	3	TX3	REDIPON	1957	10	1960	SW	9.61	RF CHOKE BURNT
74	JAYAPURA	1	SKY LINE	4	TX4	REDIPON	1957	10	1960	SW	5.045	POWER TRAFO BURNT
75	JAYAPURA	1	SKY LINE	5	TX5	PHILIPS	1969	1	1971	SW	5.045	
76	JAYAPURA	1	SKY LINE	6	TX6	REDIPON	1957	0.5	1960	SW	2.49	R100 k OHM/175 W BURNT
77	JAYAPURA	2	STUDIO	1	FM1	HARRIS	1974	0.5	1975	VHF	107.3	
78	JAYAPURA	2	STUDIO	2	FM2	LEN	1981	0.5	1982	VHF	97.8	
79	JAYAPURA	2	STUDIO	3	FM3	LEN	1983	0.5	1983	VHF	93	ASI,1 TOWER FOR 3 ANTENNA
80	BANDA ACEH	1	BLANG INDRAPURI	1	TX1	HARRIS	1976	50	1976	SW	3.905	
81	BANDA ACEH	1	BLANG INDRAPURI	2	TX2	GATES	1963	10	1963	SW	4.995	
82	BANDA ACEH	1	BLANG INDRAPURI	3	TX3	HARRIS	1976	10	1976	MW	1.25	
83	BANDA ACEH	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
84	BANDA ACEH	2	STUDIO	2	FM2	HARRIS	1976	0.05	1976	VHF	97	ALSO AS STL
85	BANDA ACEH	2	STUDIO	3	FM3	LEN	1980	0.05	1980	VHF	103	ALSO AS STL
86	BANDA ACEH	2	STUDIO	4	TX1	GATES	1953	1	1953	SW	2.4	
87	PADANG	1	GUNUNG SARIAK	1	TX1	GATES	1954	10	1954	SW	4	
88	PADANG	1	GUNUNG SARIAK	2	TX2	HARRIS	1976	10	1976	MW	1.179	
89	PADANG	1	GUNUNG SARIAK	3	TX3	GATES	1970	10	1970	SW	6.19	
90	PADANG	2	RIMBO KALUANG	1	TX1	GATES	1958	1	1958	SW	3.96	
91	PADANG	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	103.7	ALSO AS STL
92	PADANG	3	STUDIO	2	FM2	LEN	1981	0.05	1981	VHF	93.5	ALSO AS STL
93	PADANG	3	STUDIO	3	TX1	MARCONI	1976	1	1976	SW	7.14	
94	PADANG	3	STUDIO	4	FM3	RRI	1987	0.03	1987	VHF	89	
95	PEKAN BARU	1	JLN.SUDIRMAN	1	TX1	STD.ELECTRIC.	1976	0.3	1976	MW	0.927	
96	PEKAN BARU	1	JLN.SUDIRMAN	2	TX2	GATES	1958	1	1980	SW	5.885	INPUT TX PA MOD.& POW TX TB
97	PEKAN BARU	2	SIMPANG BARU	1	TX1	NEC	1975	25	1977	MW	0.927	
98	PEKAN BARU	2	SIMPANG BARU	2	TX2	NEC	1975	25	1977	MW	0.927	
99	PEKAN BARU	2	SIMPANG BARU	3	TX3	GATES	1960	10	1960	SW	5.885	
100	PEKAN BARU	3	STUDIO JUANDA	1	TX1	LEN	1980	0.05	1982	VHF	88	
101	PEKAN BARU	3	STUDIO JUANDA	2	FM2	NEC	1978	0.15	1979	VHF	88	
102	PEKAN BARU	3	STUDIO JUANDA	3	STL1	NEC	1975	0.003	1975	UHF		OTHER FREQ.:956MHz
103	JAMBI	1	MENDALO	1	TX1	RCA	1953	7.5	1954	SW	4.827	
104	JAMBI	1	MENDALO	2	TX2	HARRIS	1976	10	1976	MW	1.088	
105	JAMBI	2	SIPIN	1	TX1	TCA	1962	1	1962	SW	3.355	
106	JAMBI	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	103.7	
107	JAMBI	3	STUDIO	2	FM2	LEN	1985	0.05	1985	VHF	103.7	DAMAGED
108	PALEMBANG	1	JLN.SOSIAL	1	TX1	GATES	1951	10	1951	SW	4.855	
109	PALEMBANG	1	JLN.SOSIAL	2	TX2	GATES	1951	1	1951	SW	2.435	MOD.POWER TX DAMAGED
110	PALEMBANG	1	JLN.SOSIAL	3	TX3	RRI	1977	10	1951	MW	0.693	MOD.POWER TX DAMAGED
111	PALEMBANG	2	INDRALAYA	1	TX1	NEC	1976	25	1976	MW	1.287	
112	PALEMBANG	2	INDRALAYA	2	TX2	NEC	1976	25	1976	MW	1.287	
113	PALEMBANG	3	STUDIO	1	FM1	NEC	1976	0.15	1976	VHF	88	ALSO AS STL
114	PALEMBANG	3	STUDIO	2	FM2	LEN	1980	0.05	1980	VHF	93.5	
115	PALEMBANG	3	STUDIO	3	STL1	NEC	1976	0.003	1976	UHF	949	

	STATION	No.	LOCATION	TX	TX	MAKER	INST.	POWER(kW)	STAR. OP.	BAND	FREQUENCY(MHz)	REMARKS
116	BENGKULU	1	SURABAYA BENGKULU	1	TX1	HARRIS	1976	10	1976	SW	3.285	
117	BENGKULU	1	SURABAYA BENGKULU	2	TX2	INTERMETRONI	1978	1	1978	MW	1.242	
118	BENGKULU	1	SURABAYA BENGKULU	3	TX3	PHILIPS	1969	1	1969	SW	3.896	SPARE HEAVY DAMAGED
119	BENGKULU	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
120	BENGKULU	2	STUDIO	2	FM2	LEN	1981	0.05	1981	VHF	105	ALSO AS STL
121	TANJUNG KARANG	1	GUNUNG KUCING	1	TX1	RRI	1974	2.5	1974	SW	3.395	
122	TANJUNG KARANG	2	SUKARAME	1	TX1	HARRIS	1978	10	1978	SW	3.395	
123	TANJUNG KARANG	2	SUKARAME	2	TX2	INTERMETRONI	1979	1	1980	MW	1.035	
124	TANJUNG KARANG	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
125	TANJUNG KARANG	3	STUDIO	2	FM2	LEN	1981	0.05	1981	VHF	98	ALSO AS STL
126	BANDUNG	1	CIUBLEUIT	1	TX1	GATES	1955	10	1955	SW	3.205	
127	BANDUNG	1	CIUBLEUIT	2	TX2	RRI	1945	3	1947	SW	4.945	
128	BANDUNG	1	CIUBLEUIT	3	TX3	RRI	1968	2.5	1968	MW		
129	BANDUNG	2	GEDE BAGE	1	TX1	HARRIS	1976	10	1976	MW	0.54	
130	BANDUNG	2	GEDE BAGE	2	TX2	GATES	1970	1	1970	SW	2.42	
131	BANDUNG	2	GEDE BAGE	3	TX3	RRI	1972	0.5	1972	MW	1.38	
132	BANDUNG	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	104	
133	BANDUNG	3	STUDIO	2	FM2	LEN	1985	0.05	1985	VHF	104	
134	SEMARANG	1	KURIPAN	1	TX1	TOSHIBA	1977	10	1977	MW	0.801	
135	SEMARANG	1	KURIPAN	2	TX2	HARRIS	1976	50	1977	MW	1.17	
136	SEMARANG	2	SRONDOL	1	TX1	GATES	1976	5	1976	SW	3.935	ONE ANTENNA
137	SEMARANG	2	SRONDOL	2	TX2	GATES	1970	10	1970	SW	3.935	
138	SEMARANG	2	SRONDOL	3	TX3	RRI	1972	1	1972	SW	2.49	
139	SEMARANG	2	SRONDOL	4	TX4	MARINE	1944	0.1	1944	SW	2.49	
140	SEMARANG	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	102	ALSO AS STL
141	SEMARANG	3	STUDIO	2	FM2	NEC	1979	0.15	1979	VHF	97.6	
142	SEMARANG	3	STUDIO	3	FM3	LEN	1981	0.05	1982	VHF	93.5	ALSO AS STL
143	SEMARANG	3	STUDIO	4	STL1	NEC	1977	0.005	1977	UHF	949	
144	SURABAYA	1	EMBONG MALANG	1	TX1	RRI	1949	2	1950	SW	3.975	MODIFICATION
145	SURABAYA	1	EMBONG MALANG	2	TX2	GATES	1970	1	1971	MW	1.206	
146	SURABAYA	1	EMBONG MALANG	3	TX3	RRI	1977	0.2	1977	SW	2.37	MODULATOR DAMAGE
147	SURABAYA	1	EMBONG MALANG	4	TX4	RRI	1972	0.5	1972	MW	1.38	
148	SURABAYA	1	EMBONG MALANG	5	TX5	HARRIS	1976	10	1976	MW	0.54	
149	SURABAYA	2	MOJOSARI	1	TX1	GATES	1955	10	1955	SW	3.975	
150	SURABAYA	2	MOJOSARI	2	TX2	RRI	1949	1	1950	SW	2.37	TX MODULATOR DAMAGED
151	SURABAYA	2	MOJOSARI	3	TX3	TOSHIBA	1976	50	1976	MW	0.585	
152	SURABAYA	2	MOJOSARI	4	TX4	TOSHIBA	1976	50	1976	MW	0.585	
153	SURABAYA	3	STUDIO	1	FM1	NEC	1979	0.15	1979	VHF	97.6	ALSO AS STL PA TX DAMAGED
154	SURABAYA	3	STUDIO	2	FM2	LEN	1983	0.05	1983	VHF	97	ALSO AS STL
155	SURABAYA	3	STUDIO	3	FM3	HARRIS	1976	0.05	1976	VHF	104	
156	SURABAYA	3	STUDIO	4	FM4	LEN	1985	0.05	1985	VHF	104	
157	SURABAYA	3	STUDIO	5	STL1	NEC	1976	0.003	1976	UHF	949	2UNITES IN ONE RACK,OTHER FREQ.:956MHz
158	DENPASAR	1	ABIANSEMAL	1	TX1	GATES	1954	1	1954	SW	3.945	HEAVY DAMAGED
159	DENPASAR	1	ABIANSEMAL	2	TX2	HARRIS	1976	10	1976	MW	1.206	
160	DENPASAR	1	ABIANSEMAL	3	TX3	GATES	1955	10	1955	SW	3.945	
161	DENPASAR	1	ABIANSEMAL	4	TX4	RRI	1980	0.05	1980	MW	0.668	
162	DENPASAR	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	102	ALSO AS STL
163	DENPASAR	2	STUDIO	2	FM2	LEN	1982	0.05	1986	VHF	93.5	
164	MATARAM	1	EKAS AMPENAN	1	TX1	RRI	1976	1	1976	SW	2.495	STAND BY
165	MATARAM	2	JAGARAGA	1	TX1	GATES	1971	5	1971	SW	3.223	NO SPARE PARTS
166	MATARAM	2	JAGARAGA	2	TX2	HARRIS	1976	10	1976	MW	0.855	NO SPARE PARTS
167	MATARAM	3	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	104	ALSO AS STL SPARE PARTS NULL
168	MATARAM	3	STUDIO	2	FM2	LEN	1985	0.05	1988	VHF	104	ALSO AS STL
169	MATARAM	3	STUDIO	3	FM3	LEN	1980	0.05	1980	VHF	93.5	
170	PONTIANAK	1	JL.MALUKU	1	TX1	MARINE	1954	1	1954	SW	3.345	8 OCLOCK SPECIAL SAT.SPE.

	STATION	No.	LOCATION	TX	TX	MAKER	INST.	POWER(kW)	STAR. OP	BAND	FREQUENCY(MHz)	REMARKS
171	PONTIANAK	1	JL.MALUKU	2	TX2	RRI	1982	0.1	1982	MW	1.233	SPECIAL SAT.EVENING
172	PONTIANAK	2	WAJO HILIR	1	TX1	GATES	1958	10	1958	SW	3.995	
173	PONTIANAK	2	WAJO HILIR	2	TX2	CCA	1979	10	1979	SW	3.345	
174	PONTIANAK	2	WAJO HILIR	3	TX3	HARRIS	1976	50	1976	MW	1.233	
175	PONTIANAK	3	STUDIO	1	FM1	LEN	1979	0.05	1980	VHF	100.2	ALSO AS STL
176	PONTIANAK	3	STUDIO	2	FM2	LEN	1979	0.05	1980	VHF	88	ALSO AS STL
177	PONTIANAK	3	STUDIO	3	FM3	GATES	1979	0.05	1979	VHF	100.2	X'TAL DAMAGED
178	PONTIANAK	3	STUDIO	4	FM4	HARRIS	1976	0.05	1976	VHF	104	ERASI DAMAGED
179	PALANGKARAYA	1	CILIK RIWUT	1	TX1	HARRIS	1976	10	1976	SW	3.325	
180	PALANGKARAYA	1	CILIK RIWUT	2	TX2	GATES	1971	5	1972	SW	3.905	
181	PALANGKARAYA	1	CILIK RIWUT	3	TX3	TCA	1964	1	1964	SW	4.92	
182	PALANGKARAYA	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	88	ALSO AS STL
183	PALANGKARAYA	2	STUDIO	2	FM2	LEN	1980	0.05	1981	VHF	88	
184	SAMARINDA	1	REMPANGA	1	TX1	HARRIS	1976	10	1976	MW	1.219	
185	SAMARINDA	1	REMPANGA	2	TX2	TCA	1962	7.5	1964	SW	3.295	HEAVY DAMAGED
186	SAMARINDA	1	REMPANGA	3	TX3	LEN	1986	50		SW	6.135	ERASI IN THE REPAIR STATAS
187	SAMARINDA	2	TIRTA KENCANA	1	TX1	GATES	1957	1	1957	SW	6.135	
188	SAMARINDA	3	STUDIO	1	FM1	LEN	1980	0.05	1980	VHF	97.9	
189	SAMARINDA	3	STUDIO	2	FM2	HARRIS	1976	0.05	1976	VHF	97.9	
190	SAMARINDA	3	STUDIO	3	TX1	RRI	1986	0.5	1988	MW	1.24	OSCILLATOR:VFO
191	SAMARINDA	3	STUDIO	4	TX2	RRI	1980	0.5	1980	SW	9.603	OSCILLATOR:VFO
192	MANADO	1	MALALAYANG	1	TX1	HARRIS	1976	10	1977	SW	3.215	
193	MANADO	1	MALALAYANG	2	TX2	GATES	1959	10	1960	SW	5.99	
194	MANADO	1	MALALAYANG	3	TX3	GATES	1950	1	1952	SW	7.29	
195	MANADO	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	102	ALSO AS STL
196	MANADO	2	STUDIO	2	TX1	MDC	1983	1	1983	MW	1.206	
197	MANADO	2	STUDIO	3	TX2	RRI	1988	0.1	1987	MW	1.554	
198	KENDARI	1	LEPO-LEPO	1	TX1	GATES	1970	5	1970	SW	3.995	
199	KENDARI	1	LEPO-LEPO	2	TX2	HARRIS	1976	10	1976	MW	0.954	
200	KENDARI	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	107.3	ALSO AS STL
201	KENDARI	2	STUDIO	2	FM2	LEN	1980	0.05	1980	VHF	103	ALSO AS STL
202	KENDARI	2	STUDIO	3	TX1	RRI	1984	0.1	1984	SW	6.075	ALREADY SCRAPPED FROM INVENTORY
203	PALU	1	TONDO	1	TX1	HARRIS	1976	10	1976	SW	3.96	DEEREASED TO 3kW
204	PALU	1	TONDO	2	TX2	RRI	1959	1	1985	SW	3.96	ALREADY MODIFIED CX MATARAM
205	PALU	1	TONDO	3	TX3	RRI	1979	0.75	1986	SW	7.234	
206	PALU	1	TONDO	4	TX4	INTERMETRONI	1979	1	1982	MW	1.125	
207	PALU	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
208	PALU	2	STUDIO	2	FM2	LEN	1980	0.05	1982	VHF	105.5	ALSO AS STL
209	KUPANG	1	TUAPUKAN	1	TX1	GATES	1962	10	1962	SW	3.385	
210	KUPANG	1	TUAPUKAN	2	TX2	HARRIS	1976	10	1977	SW	3.385	
211	KUPANG	2	STUDIO	1	TX1	PHILIPS	1958	0.3	1958	SW	4.865	
212	KUPANG	2	STUDIO	2	TX2	RRI	1975	1	1975	SW	3.259	
213	KUPANG	2	STUDIO	3	FM1	GATES	1975	0.05	1975	VHF	107	
214	KUPANG	2	STUDIO	4	FM2	HARRIS	1976	0.05	1977	VHF	102	ALSO AS STL
215	KUPANG	2	STUDIO	5	FM3	LEN	1982	0.05	1983	VHF	93.5	ALSO AS STL
216	DILLI	1	MARCONI	1	TX1	TCA	1979	10	1979	SW	3.52	
217	DILLI	1	MARCONI	2	TX2	RRI	1976	0.3	1976	SW	2.5	
218	DILLI	1	MARCONI	3	TX3	RRI	1976	1	1976	SW	4	
219	DILLI	1	MARCONI	4	TX4	LEN	1983	10	1983	SW	4.282	
220	DILLI	2	STUDIO	1	FM1	LEN	1983	0.05	1983	VHF	93	ALSO AS STL
221	AMBON	1	PASSO	1	TX1	GATES	1951	1	1951	SW	3.241	
222	AMBON	1	PASSO	2	TX2	GATES	1954	10	1954	SW	7.14	AUDIO DRIVER DAMAGED
223	AMBON	1	PASSO	3	TX3	GATES	1970	10	1970	SW	4.845	
224	AMBON	1	PASSO	4	TX4	HARRIS	1976	10	1976	MW	0.72	
225	AMBON	1	PASSO	5	TX5	RRI	1983	0.5	1983	MW	1.071	
226	AMBON	2	STUDIO	1	TX1	RRI	1970	0.5	1970	SW	2.8	
227	AMBON	2	STUDIO	2	TX2	HARRIS	1976	0.05	1976	VHF	107	ALSO AS STL
228	AMBON	2	STUDIO	3	TX3	LEN	1980	0.05	1981	VHF	105	ALSO AS STL

	STATION	No.	LOCATION	TX	TX	MAKER	INST.	POWER(kW)	STAR. OP.	BAND	FREQUENCY(MHz)	REMARKS
229	BUKIT TINGGI	1	ANAK LIMAU	1	TX1	PHILIPS	1958	0.3	1958	SW	3.305	TX.MODULATOR DAMAGED
230	BUKIT TINGGI	1	ANAK LIMAU	2	TX2	GATES	1962	1	1963	SW	4.91	
231	BUKIT TINGGI	1	ANAK LIMAU	3	TX3	HARRIS	1976	10	1976	SW	3.232	
232	BUKIT TINGGI	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
233	BUKIT TINGGI	2	STUDIO	2	FM2	LEN	1982	0.05	1982	VHF	97.6	ALSO AS STL
234	SURAKARTA	1	CAWAS	1	TX1	GATES	1954	10	1954	SW	4.952	
235	SURAKARTA	1	CAWAS	2	TX2	HARRIS	1976	50	1976	MW	0.972	TUBE DAMAGED
236	SURAKARTA	2	PALUR	1	TX1	INTERMETRONI	1977	1	1977	MW	1.053	
237	SURAKARTA	3	STUDIO	1	TX1	GATES	1954	1	1954	SW	2.44	
238	SURAKARTA	3	STUDIO	2	TX2		1949	0.5	1949	SW	4.9	
239	SURAKARTA	3	STUDIO	3	FM1	HARRIS	1976	0.05	1976	VHF	102	STAND BY TUBE INECCIENT
240	SURAKARTA	3	STUDIO	4	FM2	LEN	1980	0.05	1981	VHF	105	ALSO AS STL
241	SORONG	1	KLADEMAK 3	1	TX1	HARRIS	1976	10	1976	SW	4.875	
242	SORONG	1	KLADEMAK 3	2	TX2	GATES	1960	10	1961	SW	4.875	
243	SORONG	1	KLADEMAK 3	3	TX3	REDIFON	1962	0.5	1962	SW	3.365	
244	SORONG	2	STUDIO	1	FM1	LEN	1981	0.05	1984	VHF	103	ALSO AS STL
245	SORONG	2	STUDIO	2	FM2	HARRIS	1976	0.05	1976	VHF	103	
246	BIAK	1	RIDGE 1-BIAK	1	TX1	HARRIS	1976	10	1976	MW	1.044	
247	BIAK	1	RIDGE 1-BIAK	2	TX2	RRI	1974	0.5	1982	MW	1.044	
248	BIAK	1	RIDGE 1-BIAK	3	TX3	PHILIPS	1965	1	1965	SW	5.491	
249	BIAK	1	RIDGE 1-BIAK	4	TX4	REDIFON	1962	0.5	1962	SW	7.306	
250	BIAK	2	STUDIO	1	FM1	LEN	1981	0.05	1981	VHF	107.6	ALSO AS STL
251	BIAK	2	STUDIO	2	FM2	HARRIS	1976	0.05	1976	VHF	107.6	ALSO AS STL
252	MERAUKE	1	KELAPA LIMA	1	TX1	HARRIS	1976	10	1976	MW	0.81	TUBE 4-400 DAMAGED
253	MERAUKE	1	KELAPA LIMA	2	TX2	PHILIPS	1972	1	1972	SW	3.905	
254	MERAUKE	1	KELAPA LIMA	3	TX3	PHILIPS	1976	0.5	1976	SW	9.475	
255	MERAUKE	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	107	ALSO AS STL
256	MERAUKE	2	STUDIO	2	FM2	LEN	1981	0.05	1981	VHF	107	ALSO AS STL
257	SIBOLGA	1	SARAUDIK	1	TX1	GATES	1952	1	1958	SW	3.241	MODIFICATION
258	SIBOLGA	1	SARAUDIK	2	TX2	GATES	1956	5	1976	SW	5.28	MODIFICATION
259	SIBOLGA	1	SARAUDIK	3	TX3	INTERMETRONI	1980	5	1980	MW	1.044	
260	SIBOLGA	2	STUDIO	1	FM1	PHILIPS	1977	0.05	1978	VHF	108	ALSO AS STL,UPPER REPAIRE
261	SIBOLGA	2	STUDIO	2	FM2	LEN	1981	0.05	1984	VHF	93.5	ALSO AS STL
262	TANJUNG PINANG	1	BAKAR BATU	1	TX1	GATES	1971	5	1972	MW	1.18	
263	TANJUNG PINANG	1	BAKAR BATU	2	TX2	HARRIS	1976	10	1976	SW	3.325	
264	TANJUNG PINANG	1	BAKAR BATU	3	TX3	GATES	1957	1	1962	SW	4.98	
265	TANJUNG PINANG	1	BAKAR BATU	4	TX4	MARINE	1957	0.5	1957	MW	1.18	
266	TANJUNG PINANG	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
267	TANJUNG PINANG	2	STUDIO	2	FM2	LEN	1981	0.05	1982	VHF	97.6	ALSO AS STL
268	TANJUNG PINANG	2	STUDIO	3	STL1	HARRIS	1976	0.025	1976	VHF	148	
269	BOGOR	1	SUKMAJAYA	1	TX1	INTERMETRONI	1978	5	1985	MW	1.25	
270	BOGOR	1	SUKMAJAYA	2	TX2	AEROCOMM	1958	1	1966	SW	3.96	
271	BOGOR	2	STUDIO	1	TX1	HARRIS	1976	1	1976	MW	1.235	
272	BOGOR	2	STUDIO	2	TX2	RRI	1982	1	1983	MW	1.25	
273	BOGOR	2	STUDIO	3	FM1	LEN	1981	0.05	1981	VHF	93	ALSO AS STL
274	BOGOR	2	STUDIO	4	FM2	LEN	1982	0.05	1982	VHF	97.6	
275	BOGOR	2	STUDIO	5	FM3	BAY ELECTRIC	1979	0.025	1979	VHF	91	
276	CIREBON	1	WERU	1	TX1	HARRIS	1978	10	1976	MW	0.864	
277	CIREBON	1	WERU	2	TX2	TCA	1969	1	1969	SW	2.39	NO SPARE PARTS AVAILABLE
278	CIREBON	2	STUDIO	1	TX1	STANDARD	1952	0.5	1952	MW	0.864	MODIFICATION FROM SW
279	CIREBON	2	STUDIO	2	FM1	HARRIS	1976	0.05	1976	VHF	107.3	ALSO AS STL
280	CIREBON	2	STUDIO	3	FM2	LEN	1981	0.05	1981	VHF	107.3	
281	PURWOKERTO	1	JOMPO KULON	1	TX1	HARRIS	1976	10	1976	MW	0.756	
282	PURWOKERTO	1	JOMPO KULON	2	TX2	GATES	1969	1	1969	SW	2.47	
283	PURWOKERTO	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	104	ALSO AS STL
284	PURWOKERTO	2	STUDIO	2	FM2	LEN	1981	0.05	1981	VHF	104	ALSO AS STL
285	MADIUN	1	JERUK GULUNG	1	TX1	HARRIS	1976	10	1976	MW	1.008	
286	MADIUN	1	JERUK GULUNG	2	TX2	TCA	1961	1	1961	SW	3.286	

	STATION	No.	LOCATION	TX	TX	MAKER	INST.	POWER(kW)	STAR. OP.	BAND	FREQUENCY(MHz)	REMARKS
287	MADIUN	1	JERUK GULUNG	3	TX3	RRI	1975	0.15	1975	SW	3.286	
288	MADIUN	2	PAHLAWAN	1	TX1	RRI	1971	0.25	1983	SW	2.48	
289	MADIUN	3	STUDIO	1	FM1	BAY ELECTRIC	1980	0.05	1980	VHF	99	ALSO AS STL
290	MADIUN	3	STUDIO	2	FM2	HARRIS	1976	0.05	1976	VHF	104	ALSO AS STL
291	JEMBER	1	RAMBI GUNDAM	1	TX1	HARRIS	1976	10	1976	MW	0.963	
292	JEMBER	1	RAMBI GUNDAM	2	TX2	RRI	1978	0.5	1978	SW	3.323	
293	JEMBER	1	RAMBI GUNDAM	3	TX3	TCA	1974	1	1974	SW	3.323	HEAVY DAMAGED
294	JEMBER	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	104	ALSO AS STL
295	JEMBER	2	STUDIO	2	FM2	LEN	1979	0.05	1981	VHF	88.1	
296	MALANG	1	SINGOSARI	1	TX1	HARRIS	1976	10	1976	MW	0.873	
297	MALANG	1	SINGOSARI	2	TX2	GATES	1970	1	1970	SW	2.45	TX MODULATOR DAMAGED
298	MALANG	1	SINGOSARI	3	TX3	RRI	1969	1	1969	SW	3.4	
299	MALANG	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	102	ALSO AS STL,INTERCHANGED WITH FM1
300	MALANG	2	STUDIO	2	FM2	LEN	1981	0.05	1981	VHF	102	ALSO AS STL,INTERCHANGED WITH FM2
301	SUMENEP	1	PATEAN	1	TX1	TCA	1961	1	1961	SW	3.355	NO SPARE PARTS AVAILABLE
302	SUMENEP	1	PATEAN	2	TX2	HARRIS	1976	10	1976	MW	1.098	
303	SUMENEP	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	93	ALSO AS STL
304	SUMENEP	2	STUDIO	2	FM2	LEN	1980	0.05	1980	VHF	93	ALSO AS STL
305	SINGARAJA	1	BANYUALIT	1	TX1	HARRIS	1976	10	1976	MW	1.08	
306	SINGARAJA	1	BANYUALIT	2	TX2	RRI	1969	1	1969	SW	3.395	
307	SINGARAJA	1	BANYUALIT	3	TX3	MARINE	1957	0.15	1984	SW	2.42	
308	SINGARAJA	2	STUDIO	1	FM1	HARRIS	1976	0.05	1977	VHF	103.7	ALSO AS STL
309	SINGARAJA	2	STUDIO	2	FM2	LEN	1980	0.05	1980	VHF	93.5	ALSO AS STL
310	GOLONTALO	1	MOLOSIPAT	1	TX1	HARRIS	1976	10	1976	SW	3.285	
311	GOLONTALO	1	MOLOSIPAT	2	TX2	EX JAPAN	1959	1	1959	SW	3.8	
312	GOLONTALO	1	MOLOSIPAT	3	TX3	RRI	1970	0.15	1976	SW	2.5	
313	GOLONTALO	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	102	ALSO AS STL
314	GOLONTALO	2	STUDIO	2	FM2	LEN	1980	0.05	1981	VHF	93	ALSO AS STL
315	PAK PAK	1	PAK PAK UTARA	1	TX1	PHILIPS	1972	1	1972	SW	4.79	TX DAMAGED
316	PAK PAK	1	PAK PAK UTARA	2	TX2	REDIFON	1962	0.5	1982	SW	7.285	
317	PAK PAK	1	PAK PAK UTARA	3	TX3	PTI	1969	0.3	1969	SW	6.425	
318	PAK PAK	2	STUDIO	1	FM1	LEN	1981	0.05	1982	VHF	93.5	
319	MANOKWARI	1	EKONOMI REREMI	1	TX1	PHILIPS	1972	1	1972	SW	3.345	
320	MANOKWARI	1	EKONOMI REREMI	2	TX2	REDIFON	1962	0.5	1982	SW	6.185	NO SPARE PARTS AVAILABLE
321	MANOKWARI	1	EKONOMI REREMI	3	TX3	RRI	1974	0.5	1974	SW	3.845	
322	MANOKWARI	2	STUDIO	1	FM1	LEN	1981	0.05	1982	VHF	103	ALSO AS STL
323	NABIRE	1	STUDIO/TX	1	TX1	RRI	1976	0.5	1977	SW	6.125	
324	NABIRE	1	STUDIO/TX	2	TX2	RRI	1981	1	1982	SW	7.295	
325	NABIRE	1	STUDIO/TX	3	TX3	RRI	1984	1	1984	SW	3.388	
326	NABIRE	1	STUDIO/TX	4	TX4	LEN	1981	0.05	1982	VHF	102	
327	SERUI	1	PEMANCAR	1	TX1	RRI	1977	0.5	1978	SW	4.805	
328	SERUI	1	PEMANCAR	2	TX2	INTERMETRONI	1981	1	1981	SW	0.535	
329	SERUI	1	PEMANCAR	3	TX3	ASAHI	1975	0.3	1975	SW	3.395	
330	SERUI	2	STUDIO	1	FM1	LEN	1981	0.05	1981	VHF	93.5	
331	WAMENA	1	STUDIO/TX	1	TX1	RRI	1974	0.3	1977	SW	5.04	
332	WAMENA	1	STUDIO/TX	2	TX2	PHILIPS	1969	0.3	1969	SW	5.04	
333	WAMENA	1	STUDIO/TX	3	FM1	LEN	1981	0.05	1982	VHF	93.5	
334	TERNATE	1	KAYU MERAH	1	TX1	HARRIS	1976	10	1976	SW	3.345	
335	TERNATE	1	KAYU MERAH	2	TX2	RRI	1952	0.3	1952	SW	3.326	
336	TERNATE	1	KAYU MERAH	3	TX3	RRI	1963	0.3	1963	SW	3.845	
337	TERNATE	1	KAYU MERAH	4	TX4	RRI	1974	1	1974	SW	3.915	
338	TERNATE	2	STUDIO	1	FM1	HARRIS	1976	0.05	1976	VHF	102	INTERCHANGED WITH FM2
339	TERNATE	2	STUDIO	2	FM2	HARRIS	1976	0.05	1976	VHF	102	INTERCHANGED WITH FM1
340	TERNATE	2	STUDIO	3	FM3	LEN	1980	0.05	1981	VHF	93.5	

List of TVRI TV Stations

	AREA	PROVINCE	STATION	LONG.	LAT.	ALT	TWR	CH	ANT	POL	P(kW)	ERP(kW)	INST	TX YR	Tx MKR	PRO.BY	PRO.FRM
1	1	D.I.Aceh	Banda Aceh	95E18	5N32	32	100	3		V	1	6.3	1975	76	MARCONI	SBB	PERUMTEL
2		D.I.Aceh	Banda Aceh								1		1975	77	MARCONI		
3		D.I.Aceh	Lhokseumawe	97E08	5N11	10	100	9		H	1		1978	78	LEN	TVRO	
4		D.I.Aceh	Lhokseumawe								1		1978	84	LEN		
5		D.I.Aceh	Takengon	96E49	4N40	1450	40	6		H	0.3		1979	79	LEN	TVRO	
6		D.I.Aceh	Takengon								0.3		1979	84	LEN		
7		D.I.Aceh	Meulaboh	96E08	4N09	5	40	4		H	0.3		1979	79	LEN	TVRO	
8		D.I.Aceh	Meulaboh								0.3		1979	81	LEN		
9		D.I.Aceh	Kutakane	97E50	3N29	120	40	9		H	0.3		1979	79	LEN	TVRO	
10		D.I.Aceh	Tapakutuan	97E11	3N15	50	65	7		H	0.3	5.4	1981	82	LEN	TVRO	
11		D.I.Aceh	Tapakutuan								0.3		1981	83	LEN		
12		D.I.Aceh	Sigli	95E59	5N16	20	65	4		H	0.3	1.8	1981	82	LEN	TVRO	
13		D.I.Aceh	Langsa	97E56	4N31	20	100	7		H	1	40	1981	82	LEN	TVRO	
14		D.I.Aceh	Langsa								1		1981	82	LEN		
15		D.I.Aceh	Singkil Baru	97E38	2N10	5	65	5		H	0.1	4	1982	82	LEN	SBK/COSI TE	
16		D.I.Aceh	Singkil Baru								0.1		1982	82	LEN		
17		D.I.Aceh	Sinabang			2	40	4		H	0.1		1986	87	LEN	TVRO	
18		D.I.Aceh	Sinabang								0.1		1986	88	LEN		
19		D.I.Aceh	Blangkejeren			1010	40	5			0.1		1986	87	LEN	TVRO	
20		D.I.Aceh	Blangkejeren								0.1		1986	88	LEN		
21		D.I.Aceh	Sabang			300	40	6			0.05		1986	87	LEN	off air	Banda Aceh
22		D.I.Aceh	Sabang								0.05		1986	88	LEN		
23	2	Sumatera Utara	Medan	98E42	3N35	20	25	SHF			0.001		1970	70	SHIBADEN	STO&SBB	PERUMTEL
24		Sumatera Utara	Medan								0.001		1970	70	SHIBADEN		
25		Sumatera Utara	Bandar Baru	98E33	3N17	760	55	5		H	10	126	1970	80	NEC	SHF	Medan
26		Sumatera Utara	Bandar Baru								10		1970	70	SHIBADEN		
27		Sumatera Utara	Teb.Tinggi(Sumut)	99E08	3N20	30	70	9		H	0.1	1.6	1977	77	JRC	off air, SHF	B.Baru
28		Sumatera Utara	Teb.Tinggi(Sumut)								0.01		1977	82	ASSOCIATE		
29		Sumatera Utara	Pematang Siantar	99E09	2N56	450	70	6		H	1	6.3	1977	77	JRC	SHF	T.Tinggi
30		Sumatera Utara	Parapat	98E57	2N41	950	40	6		H	0.01	0.01	1977	77	JRC	off air	S.Jarunjun
31		Sumatera Utara	Simarjarunjung	98E46	2N56	1600	100	10		H	10	224	1982	82	THOMSON	SHF	P.Siantar
32		Sumatera Utara	Simarjarunjung								10		1982	82	THOMSON		
33		Sumatera Utara	Siborong-Borong	98E59	2N19	1655	100	6		H	0.3	4.8	1982	82	LEN	off air	S.Jarunjun g
34		Sumatera Utara	Siborong-Borong								0.3		1982	82	LEN		
35		Sumatera Utara	Tarutung	98E57	2N01	1100	100	4		H	0.3	2.4	1982	82	LEN	off air	Sib.Borong
36		Sumatera Utara	Tarutung								0.3		1982				
37		Sumatera Utara	Sibolga	98E46	1N45	90	85	4		H	1		1981	81	JRC	TVRO	
38		Sumatera Utara	Sibolga								1		1981	82	LEN		
39		Sumatera Utara	Rantau Prapat	99E50	2N06	40	100	6		H	10		1981	83	THOMSON	TVRO	
40		Sumatera Utara	Rantau Prapat								1		1981	81	JRC		
41		Sumatera Utara	Sipirok	99E57	2N01	1080	65	8		H	0.1	4	1981	82	LEN	TVRO	
42		Sumatera Utara	Sipirok								0.1		1981	82	LEN		
43		Sumatera Utara	Padang Sidempuan	99E16	1N22	320	65	5		H	0.1		1981	81	LEN	TVRO	
44		Sumatera Utara	Padang Sidempuan								0.1		1981	81	JRC		
45		Sumatera Utara	Padang Sidempuan								0.3		1981	83	LEN		
46		Sumatera Utara	Kotanopan	99E38	0N43	550	100	9		H	0.3	10.7	1982	82	LEN	TVRO	
47		Sumatera Utara	Kotanopan										1982	82	LEN		
48		Sumatera Utara	G.Sitoli	91E37	1N16	65	65	6		H	0.1	0.3	1982	82	LEN	TVRO	
49		Sumatera Utara	G.Sitoli										1982	82	LEN		
50		Sumatera Utara	Sibuhuan			143	40	4		H	0.01		1987	87	LEN	TVRO	
51		Sumatera Utara	Gunung Tua			52	12	10			0.0005		1988		NORM	off air	
52	3	Sumatera Barat	Padang	100E23	0S55	5	45	9		H	0.1		1976	77	LEN	SBB	
53		Sumatera Barat	Padang								0.3		1976	88	LEN		

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54		Sumatera Barat	Padang								0.001		1976	84	AVANTEK		
55		Sumatera Barat	G.Gompong	100E39	0S58	1700	85	8	H		5	80	1977	77	PYE	SHF	B.Srh.
56		Sumatera Barat	G.Gompong								5		1977	77	PYE		
57		Sumatera Barat	Pandaisikat	100E22	0S25	1666	85	5	H		5	17	1977	77	PYE	off air, TVRO	G.Gompong
58		Sumatera Barat	Pandaisikat								5		1977	77	PYE		
59		Sumatera Barat	Painan	100E34	1S21	5	60	4	H		0.1		1981	82	LEN	SBK/COSI TE	
60		Sumatera Barat	Painan								0.1		1981	82	LEN		
61		Sumatera Barat	Puncak Lawang			1225	12	4	H		0.01		1981	81	RFC	TVRO	
62		Sumatera Barat	Puncak Lawang								0.01		1981	87	LEN		
63		Sumatera Barat	Lubuk Sikaping	100E11	0N05	470	65	4			0.3	12	1982	82	LEN	TVRO	
64		Sumatera Barat	Lubuk Sikaping								0.3		1982	83	LEN		
65		Sumatera Barat	Pasaman Barat	99E52	0N12	180	65	9			0.3	12	1982	82	LEN	TVRO	
66		Sumatera Barat	Pasaman Barat								0.3		1982	82	LEN		
67		Sumatera Barat	Bukit Sarch			200	35	SHF	H		0.001		1984	84	AVANTEK	SHF	Padang
68		Sumatera Barat	Sawahlunto			650	25	6			0.01		1985	85	RFC	TVRO	
69		Sumatera Barat	Muara Labuh			950	40	8			0.1		1986	87	LEN	TVRO	
70		Sumatera Barat	Bukit Palakat			50	40	4			0.1		1986	87	LEN	TVRO	
71		Sumatera Barat	Bukit Palakat								0.1		1986	88	LEN		
72	4	Riau	Pekanbaru	101E27	0S33	20	100	7	H		10	130	1977	77	PYE	SBB	
73		Riau	Pekanbaru								10		1977	77	PYE		
74		Riau	Pulau Batam	104E00	1N06	133	100	5	H		5		1977	82	SIEMENS	TVRO	
75		Riau	Pulau Batam								10		1977	83	LEN		
76		Riau	G.Muncung	104E29	0S30	402	45	8	H		1	1.6	1973	73	PYE	off air	Dabo
77		Riau	Natuna	108E22	3N55	30	85	7	H		0.3		1980	80	LEN	TVRO	
78		Riau	Natuna								0.3		1980	85	LEN		
79		Riau	Natuna								0.3		1980	85	LEN		
80		Riau	Tarempa	106E12	3N13	30	65	9	H		0.1	2.3	1983	83	LEN	TVRO	
81		Riau	Tarempa								0.1		1983	83	LEN		
82		Riau	Dumai	101E23	1N38	15	100	11	H		10	660	1983	83	THOMSON	TVRO	
83		Riau	Dumai								1		1983	83	LEN		
84		Riau	Siak	102E02	0N48	15	100	4	H		10	612	1983	83	THOMSON	TVRO	
85		Riau	Siak								1		1983	83	LEN		
86		Riau	Rengat	102E31	0S22	6	65	9	H		0.1	2.3	1982	82	LEN	SBK/Cosite	
87		Riau	Rengat								0.1		1982	83	LEN		
88		Riau	Sungai Pakning	102E09	1N20	3	100	6	H		10	214	1983	83	THOMSON	TVRO	
89		Riau	Sungai Pakning								10		1983	83	THOMSON		
90		Riau	Kijang/Bintan			40	40	8	H		0.1		1987	87	LEN	TVRO	
91	4	Riau	Kijang/Bintan								0.1		1988	87	LEN		
92		Riau	Dabo					5			0.01		1982	82	R.Communication	TVRO	
93	5	Jambi	Jambi	103E34	1S36	14	100	5	H		10	110	1977	77	PYE	SBB	
94		Jambi	Jambi								10		1977	77	PYE		
95		Jambi	Bangko	102E17	2S53	50	65	9	H		0.1	1.8	1984	82	LEN	TVRO	
96		Jambi	Bangko								0.1		1984	83	LEN		
97		Jambi	Sungai Penuh	101E12	2S04	805	65	7	H		0.1		1984	82	LEN	TVRO	
98		Jambi	Sungai Penuh								0.1		1984	83	LEN		
99		Jambi	Kuala Tungkal	103E00	0S01	20	65	10	H		1	17.8	1984	82	LEN	TVRO	
100		Jambi	Kuala Tungkal								1		1984	82	LEN		
101		Jambi	Muara Bungo			80	40	7			0.1		1987	87	LEN	TVRO	
102	6	Sumatera Selatan	Palembang	104E46	2S59	3	100	9	H		5	170	1973	73	SIEMENS	STO&SBB	PERUMTEL
103		Sumatera Selatan	Palembang								10		1973	83	THOMSON		
104		Sumatera Selatan	G.Manumbing	105E11	2S01	443	53	6	H		5	50	1973	73	PYE	off air &TVRO	Palembang
105																	

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106		Sumatera Selatan	G.Mangkol	106E07	2S14	389	53	4		H	1	20	1973	73	PYE	off air	G.Manumbing
107		Sumatera Selatan	G.Muntai	106E31	2S59	292	53	7		H	5	100	1973	73	PYE	off air	G.Mangkol
108		Sumatera Selatan	G.Tajam	107E52	2S46	496	53	5		H	1	16	1973	73	PYE	off air	G.Muntai
109		Sumatera Selatan	G.Tajam								1		1973	82	LEN	&TVRO	
110		Sumatera Selatan	Prabumulih	104E15	3S25	50	85	7		H	5	166	1981	83	THOMSON	off air	Palembang
111		Sumatera Selatan	Prabumulih								5		1981	83	THOMSON		
112		Sumatera Selatan	Prabumulih								2		1981	81	NERA		
113		Sumatera Selatan	Muara Enim	103E46	3S40	50	65	4		H	1	2.2	1982	82	LEN	off air	Prabumulih
114		Sumatera Selatan	Muara Enim								1		1982	82	LEN		
115		Sumatera Selatan	Baturaja	104E08	4S07	180	85	11		H	1	40	1982	83	LEN	off air	Prabumulih
116		Sumatera Selatan	Baturaja								1		1982	83	LEN		
117		Sumatera Selatan	Teb.Tinggi(Sumsel)	103E16	3S36	140	65	8		H	1	23	1982	82	LEN	off air	Lahat
118		Sumatera Selatan	Teb.Tinggi(Sumsel)								1		1982	83	LEN		
119		Sumatera Selatan	Lahat	103E32	3S46	175	65	10		H	1	24	1982	82	LEN	off air	P.Bumulih/Enim
120		Sumatera Selatan	Lahat								1		1982	82	LEN		
121		Sumatera Selatan	Sekayu			10	40	11		H	0.1		1986	87	LEN	off air	Prabumulih
122	7	Bengkulu	Bengkulu	102E16	3S48	10	100	8		H	1	11	1977	77	PYE	SBB	
123		Bengkulu	Bengkulu								1		1977	77	PYE		
124		Bengkulu	Curup	102E32	3S27	675	65	4		H	0.1	0.5	1982	82	LEN	TVRO	
125		Bengkulu	Curup								0.1		1982	82	LEN		
126		Bengkulu	Manna	102E32	4S27	55	65	8		H	0.1		1983	83	LEN	TVRO	
127		Bengkulu	Manna								0.1		1983	83	LEN		
128		Bengkulu	Ipuh			35	65	8		H	0.3		1986	86	LEN	TVRO	
129		Bengkulu	Tess			580	45	10			0.01		1988	88		TVRO	
130		Bengkulu	Tess								0.01		1988	88			
131	8	Lampung	Tanjung Karrang	105E14	5S25	110	45	SHF		H	0.0005		1977	77	ASSOCIATE	SBB	
132		Lampung	Tanjung Karrang								0.0005		1977	77	ASSOCIATE		
133		Lampung	G.Betung	105E09	5S24	480	85	3		H	1	8.5	1977	77	MARCONI	SHF	TJ.Karang
134		Lampung	G.Betung								1		1977	77	MARCONI		
135		Lampung	Kotabumi	104E48	4S42	50	65	8		H	1	11.7	1982	82	LEN	TVRO	
136		Lampung	Kotabumi								1		1982	82	LEN		
137		Lampung	Kota Agung	104E32	5S28	8	65	4		H	0.3		1982	82	LEN	TVRO	
138		Lampung	Kota Agung								0.3		1982	82	LEN		
139		Lampung	Krui	103E56	5S11	5	65	6		H	0.1	1.8	1982	82	LEN	SBK/Cositel	PERUMTEL
140		Lampung	Krui								0.1		1982	82	LEN		
141		Lampung	Padang Cermin			85	65	10			0.1		1987	87	LEN	TVRO	
142	9	D.K.I.Jakarta	Senayan	106E49	6S13	10	148	6		H	20		1962	80	SIEMENS	STO,SBB,MW	
143		D.K.I.Jakarta	Senayan								20		1962	89	NEC		
144		D.K.I.Jakarta	Senayan								5		1962	79	SIEMENS		
145		D.K.I.Jakarta	Senayan				88	8			10		1962	76	NEC		
146		D.K.I.Jakarta	Senayan								10		1962	76	NEC		
147		D.K.I.Jakarta	Bidaracina	106E52	6S14	13	15	SHF			0.001		1965		LENKURT	SHF	Senayan
148	10	Jawa Barat	Bandung			675	15	SHF			0.001		1986	87	ASSOCIATE	TVRO	
149		Jawa Barat	G.Malang	107E36	6S46	1200	70	11			0.1		1965	87	LEN	off air	Nagrak
150		Jawa Barat	G.Malang					SHF			0.001		1965	76	LENKURT		
151		Jawa Barat	G.Malang								0.001		1965	76	LENKURT		
152		Jawa Barat	G.Malang								0.001		1965	80	ASSOCIATE		
153		Jawa Barat	Nagrak	107E38	6S46	1625	71	7		H	5	37	1967	78	NEC	SHF	Bandung
154		Jawa Barat	Nagrak								5		1967	80	NEC		
155		Jawa Barat	Tangkubanprahu	107E37	6S47	1600	20	5		H	0.02		1963	63	ITB	off air	Jakarta
156		Jawa Barat	Cikuray	107E53	7S18	1500	20	4		H	0.3	7.8	1973	82	LEN	off air	G.Nagrak
157		Jawa Barat	Cikuray								0.3		1973	82	LEN		

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158		Jawa Barat	Cirebon	108E33	6S41	3	83	4		H	0.5	3.3	1969	76	NEC	SHF	G.Malang
159		Jawa Barat	Cirebon								0.5		1969	80	NEC		
160		Jawa Barat	Cirebon								0.001		1969		LENKURT		
161		Jawa Barat	Bukit Nyampai	107E58	6S47	800	45	9		H	0.1	0.5	1979	79	MARCONI	off air	G.Nagrak
162		Jawa Barat	Bukit Nyampai								0.1		1979	79	MARCONI		
163		Jawa Barat	Pasir Sumbul	106E59	6S42	1470	62	3		H	0.03	0.1	1979	79	TOSHIBA	off air	Jakarta
164		Jawa Barat	Pasir Sumbul								1		1979		VARIANT		
165		Jawa Barat	G.Walad	106E50	6S55	726	29	4		H	0.1	1	1979	79	TOSHIBA	off air	Jakarta
166		Jawa Barat	Pasir Pogor	107E00	6S51	1260	38	2		H	0.1	1	1979	79	TOSHIBA	off air	G.Walad
167		Jawa Barat	Cilegon	105E46	5S59	130	100	4		H	0.3	8.5	1982	82	LEN	off air	Jakarta
168		Jawa Barat	Cilegon								0.3		1982	83	LEN		
169		Jawa Barat	Kuningan	108E14	6S58	650	65	8		H	0.1	0.2	1981	82	LEN	off air	Cirebon
170		Jawa Barat	Kuningan								0.1		1981	82	LEN		
171		Jawa Barat	Ciamis	108E35	7S15	506	65	10		H	0.1	0.2	1981	82	LEN	off air	G.Cikurai
172		Jawa Barat	Ciamis								0.1		1981	82	LEN		
173		Jawa Barat	Salopa/Pasir Koja			600	40	6			0.1		1986	87	LEN	off air	Cikurai
174		Jawa Barat	Salopa/Pasir Koja								0.1		1986	88	LEN		
175		Jawa Barat	Puncak surangga			823	40	10			0.1		1986	87	LEN	off air	Walad
176		Jawa Barat	Puncak surangga								0.1		1986	88	LEN		
177		Jawa Barat	Bayah			175	65	4		H	0.3		1989	89		off air	
178	11	Jawa Tengah	Gombel	110E26	7S03	270	55	4		H	5	41	1966	78	TOSHIBA	SHF/UHF	Tawangmang
179		Jawa Tengah	Gombel								5		1966	82	TOSHIBA		
180		Jawa Tengah	Semanggi	111E26	7S04	250	60	7		H	0.6		1975	77	JRC	off air	Gombel
181		Jawa Tengah	Colo		6S40	600	29	8		H	0.3	5	1979	79	TOSHIBA	off air	Gombel
182		Jawa Tengah	G.Gantungan	109E14	7S04	433	80	6		H	1	12	1968	78	NEC	SHF/UHF	G.Priksa
183		Jawa Tengah	G.Gantungan								1		1968	80	NEC		
184		Jawa Tengah	G.Gantungan								0.001		1968		LENKURT		
185		Jawa Tengah	G.Priksa	109E57	6S57	50	40	3		H	0.03		1977	77	MARCONI	off air & SHF/UHF	
186		Jawa Tengah	G.Priksa					SHF			0.001		1977		LENKURT	SHF	Gombel
187		Jawa Tengah	Tawangmangu	111E11	7S40	1200	28	3		H	0.03		1977	77	MARCONI	off air	
188		Jawa Tengah	Tawangmangu					SHF			0.001		1977	77	LENKURT	SHF	Yogyakarta
189		Jawa Tengah	Tawangmangu								0.001		1977	77	LENKURT		
190		Jawa Tengah	G.Tugel	109E55	8S42	68	45	6		H	0.1	0.32	1979	80	MARCONI	off air	Depok
191		Jawa Tengah	G.Tugel								0.1		1979	80	MARCONI		
192		Jawa Tengah	Kledung	110E02	7S21	136	40	7		H	1		1975	79	SIEMENS	off air	Gombel
193		Jawa Tengah	Kledung								1		1975	86	LEN		
194		Jawa Tengah	Kledung								0.1		1975	75	ITB		
195		Jawa Tengah	Mandiraja	109E33	7S27	100	60	5		H	0.1		1975	75	EMCEE	off air	Kledung
196		Jawa Tengah	G.Depok	109E15	7S33	348	100	9		H	5	47.8	1979	80	SIEMENS	off air	Kledung
197		Jawa Tengah	Wungurejo	110E48	7S46	209	85	10		H	1	4.5	1982	82	NEC	off air	Yogyakarta
198		Jawa Tengah	Wungurejo								1		1982	82	NEC		
199		Jawa Tengah	Grabag			80	18	4			0.01		1987		NORM	TVRO	
200	12	D.I.Yogyakarta	Yogyakarta	110E22	7S46	137	100	8		H	5	80	1965	64	TOSHIBA	STO,SBB	PERUMTEL
201		D.I.Yogyakarta	Yogyakarta								10		1965	76	TOSHIBA		
202		D.I.Yogyakarta	Yogyakarta								0.001		1965		LENKURT		
203	13	Jawa Timur	Surabaya	112E43	7S18	6	85	9		H	10	190	1971	77	MARCONI	STO,SBB	
204		Jawa Timur	Surabaya								10		1971	77	MARCONI		
205		Jawa Timur	Surabaya								0.0001		1971		LENKURT		
206		Jawa Timur	G.Gebug	112E39	7S49	900	60	3		H	0.3	6.9	1973	81	TOSHIBA	off air	Surabaya
207		Jawa Timur	G.Brengik	113E36	7S48	322	85	6		V	1	14.7	1977	77	MARCONI	off air	Surabaya
208		Jawa Timur	G.Brengik								1		1977	77	MARCONI		
209		Jawa Timur	Jabung	112E30	7S36	55	55	SHF			0.001		1975	73	LENKURT	SHF	Surabaya
210		Jawa Timur	Jabung								0.001		1975	73	LENKURT		
211		Jawa Timur	Cemorosewu	111E12	7S40	1818	100	6		H	2	45	1971	81	TOSHIBA	SHF	Saradan

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212		Jawa Timur	Cemorosewu								2		1971	81	TOSHIBA		
213		Jawa Timur	Cemorosewu								0.0001		1971		LENKURT		
214		Jawa Timur	Saradan	111E07	9S11	125	50	SHF		H	0.001		1977	77	LENKRT	SHF	Jabung
215		Jawa Timur	Saradan								0.001		1977	77	LENKRT		
216		Jawa Timur	Pare	112E12	7S45	140	60	8		H	0.1	9.8	1974	74	LEN	off air	Cemorosewu
217		Jawa Timur	Pare								0.3		1974	81	TOSHIBA		
218		Jawa Timur	G.Banon	112E02	8S12	344	29	4		H	0.1	1	1979	78	TOSHIBA	off air	Cemorosewu
219		Jawa Timur	G.Dock	113E08	7S57	1268	85	7		H	1	15.3	1977	78	MARCONI	off air	Surabaya
220		Jawa Timur	G.Dock								1		1977	78	MARCONI		
221		Jawa Timur	G.Gending	113E57	8S15	840	85	4		H	1	14.1	1977	78	MARCONI	off air	G.Dock
222		Jawa Timur	G.Gending								1		1977	78	MARCONI		
223		Jawa Timur	G.Pandan	111E07	7S28	630	65	11		H	5	63.1	1982	82	NEC	off air	Surabaya
224		Jawa Timur	G.Pandan								5		1982	82	NEC		
225		Jawa Timur	G.Brengos	111E11	7S57	1190	65	3		H	0.1		1982	82	LEN	off air	Pandan
226		Jawa Timur	G.Brengos								0.1		1982	82	LEN		
227		Jawa Timur	Pacitan	111E09	8S12	525	65	5		H	0.1	0.22	1982	82	LEN	off air	G.Brengos
228		Jawa Timur	Pacitan								0.1		1982	82	LEN		
229		Jawa Timur	Banyuwangi	114Ee1 5	8s20	110	65	6			0.1		1982	82	LEN	off air	G.Gending
230		Jawa Timur	Banyuwangi								0.1		1982	83	LEN		
231		Jawa Timur	Batu			1100	65	5			0.05		1985	85	LEN	off air	G.Gebug
232		Jawa Timur	Batu								0.05		1985	85	LEN		
233		Jawa Timur	Trenggalek			860	40	11			0.1		1986	87	LEN	off air	Pare
234		Jawa Timur	Tuban			430	40	5			0.1		1987	87	LEN	off air	Surabaya
235		Jawa Timur	G.Mas/Bawean			180	40	8			0.1		1986	87	LEN	TVRO	
236		Jawa Timur	G.Mas/Bawean								0.1		1986	88	LEN		
237	14	Bali	Denpasar	115E13	8S39	12	45	SHF			0.001		1976	77	THOMSON	STO,SBB	
238		Bali	Denpasar								0.001		1976	77	THOMSON		
239		Bali	Bukit Bakung	115E12	8S39	130	85	8		H	5	100	1976	77	THOMSON	SHF	Denpasar
240		Bali	Bukit Bakung								5		1976	77	THOMSON		
241		Bali	Kintamani	115E20	8S12	1745	85	5		H	1	8.9	1977	77	THOMSON	off air	Bkt.Bakung
242		Bali	Kintamani								1		1977	77	THOMSON		
243	15	N.T.B.	Mataram	116E19	8S35	16	45	SHF		H	0.001		1976	77	THOMSON	SBB	
244		N.T.B.	Mataram								0.001		1976	77	THOMSON		
245		N.T.B.	Seganteng	116E23	8S35	400	100	7		H	1	3.5	1976	77	THOMSON	SHF	Mataran
246		N.T.B.	Seganteng								1		1976	77	THOMSON		
247		N.T.B.	Bima	118E50	8S33	843	40	9		H	0.05		1979	79	LEN	TVRO	
248		N.T.B.	Bima								0.3		1979	83	LEN		
249		N.T.B.	Sumbawa Besar	117E20	8S33	450	65	5		H	0.1	0.9	1982	82	LEN	TVRO	
250		N.T.B.	Sumbawa Besar								0.1		1982	83	LEN		
251		N.T.B.	Dompu	118E28	8S32	15	65	7		H	0.3		1983	83	LEN	TVRO	
252		N.T.B.	Dompu								0.3		1983	83	LEN		
253		N.T.B.	Swela			600	25	9			0.005		1984		RFC	TVRO	
254	16	N.T.T.	Kupang	123E36	10S10	85	45	SHF			0.001		1977	77	THOMSON	SBB	
255		N.T.T.	Kupang								0.001		1977	77	THOMSON		
256		N.T.T.	Oben	123E40	9S57	500	100	9		H	15	220	1977	77	THOMSON	SHF	Kupang
257		N.T.T.	Oben								15		1977	77	THOMSON		
258		N.T.T.	Atambua	120E53	9s07	400	60	5		H	0.05		1979	79	LEN	TVRO	
259		N.T.T.	Atambua								0.05		1979	88	LEN		
260		N.T.T.	Waingapu 1	120E16	9S39	5	60	7		H	0.05		1979	79	LEN	SBB&	
261		N.T.T.	Waingapu 2			390	65	7		H	0.1		1979	88	LEN	TVRO	
262		N.T.T.	Waingapu 2								0.1		1979	88	LEN		
263		N.T.T.	Maumere	122E13	8S37	80	50	7		H	0.3		1980	80	LEN	TVRO	
264		N.T.T.	Maumere								0.3		1980	85	LEN		
265		N.T.T.	Adonara	123E00	8S22	300	65	4		H	0.1		1983	83	LEN	TVRO	
266		N.T.T.	Adonara								0.1		1983	83	LEN		

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267		N.T.T.	Kefamenanu	124E30	9S26	350	65	7		H	0.05		1982	82	LEN	TVRO	
268		N.T.T.	Kefamenanu								0.05		1982	82	LEN		
269		N.T.T.	Ruteng	120E28	8S36	1300	65	7		H	0.05	0.22	1982	82	LEN	TVRO	
270		N.T.T.	Ruteng								0.05		1982	82	LEN		
271		N.T.T.	Ende	121E40	8S50	90	65	5		H	0.1	1	1982	82	LEN	TVRO	
272		N.T.T.	Ende								0.1		1982	82	LEN		
273		N.T.T.	Kalabahi			30	65	7			0.3		1986	87	LEN	TVRO	
274		N.T.T.	Kalabahi								0.3		1986	88	LEN		
275		N.T.T.	Bajawa			1170	65	4			0.3		1986	87	LEN	TVRO	
276		N.T.T.	Bajawa								0.3		1986	88	LEN		
277		N.T.T.	Waikabubak			400	65	4			0.3		1986	87	LEN	TVRO	
278		N.T.T.	Waikabubak								0.3		1986	88	LEN		
279		N.T.T.	Soe			870	65	4			0.1		1987	87	LEN	TVRO	
280		N.T.T.	Soe								0.1		1987	88	LEN		
281		N.T.T.	Rote			260	65	4			0.1		1987	87	LEN	TVRO	
282		N.T.T.	Rote								0.1		1987	88	LEN		
283		N.T.T.	Seba/P.Sawu			10	65	4			0.1		1987	87	LEN	TVRO	
284		N.T.T.	Seba/P.Sawu								0.1		1987	88	LEN		
285		N.T.T.	Lembata/Lewoleba			50	65	7			0.1		1989	89	LEN	TVRO	
286		N.T.T.	Lembata/Lewoleba								0.1		1989	89	LEN		
287	17	Kalimantan Barat	Pontianak	109E20	0S02	6	100	7		H	10	150	1976	77	PYE	SBB	
288		Kalimantan Barat	Pontianak								10		1976	77	PYE		
289		Kalimantan Barat	Sanggauledo	109E43	1N10	85	65	5		H	0.3		1980	80	LEN	TVRO	
290		Kalimantan Barat	Sanggauledo								0.3		1980	82	LEN		
291		Kalimantan Barat	Balaikarangan	110E25	0S50	185	65	4		H	0.3		1980	80	LEN	TVRO	
292		Kalimantan Barat	Balaikarangan								0.3		1980	82	LEN		
293		Kalimantan Barat	Semitau 2	111E59	0S32	60	100	4		H	1	31.6	1980	82	LEN	TVRO	
294		Kalimantan Barat	Semitau 2								1		1980	82	LEN		
295		Kalimantan Barat	Sanggau	110E35	0N07	40	65	5		H	0.1	1.6	1982	82	LEN	TVRO	
296		Kalimantan Barat	Sanggau								0.1		1982	82	LEN		
297		Kalimantan Barat	Sambas	109E18	1N21	15	65	4		H	1	10.5	1982	82	LEN	TVRO	
298		Kalimantan Barat	Sambas								1		1982	82	LEN		
299		Kalimantan Barat	Sintang	111E30	0N05	30	65	8		H	0.1	1.6	1982	82	LEN	TVRO	
300		Kalimantan Barat	Sintang								0.1		1982	82	LEN		
301		Kalimantan Barat	Nanga Merakai	111E30	0N41	30	65	7		H	1	40	1982	82	LEN	TVRO	
302		Kalimantan Barat	Nanga Merakai								1		1982	82	LEN		
303		Kalimantan Barat	Ketapang	109E58	1S50	10	65	9		H	0.1	4	1982	82	LEN	SBK/Cosite	
304		Kalimantan Barat	Ketapang								0.1		1982	82	LEN		
305		Kalimantan Barat	Putussibau	112E57	0N50	15	65	4		H	0.1	1.8	1982	82	LEN	SBK/Cosite	
306		Kalimantan Barat	Putussibau								0.1		1982	82	LEN		
307		Kalimantan Barat	Singkawang			35	65	11			0.1		1986	87	LEN	TVRO	
308		Kalimantan Barat	Singkawang								0.1		1986	87	LEN		
309	18	Kalimantan Selatan	Banjarmasin	114E36	3S19	5	100	5		H	10	180	1976	77	PYE	SBB	PERUMTEL
310		Kalimantan Selatan	Banjarmasin								10		1976	77	PYE		
311		Kalimantan Selatan	Kotabaru	116E14	3S15	60	60	4		H	0.15		1980	79	LEN	TVRO	
312		Kalimantan Selatan	Kotabaru								0.15		1980	79	LEN		
313		Kalimantan Selatan	Kandangan	115E14	2S51	75	85	7		H	0.3	3.6	1982	82	LEN	off air	Banjarmasin
314		Kalimantan Selatan	Kandangan								0.3		1982	82	LEN		
315		Kalimantan Selatan	Amuntai	115E15	2S25	10	65	9		H	1	2.2	1982	82	LEN	off air	Kandangan
316		Kalimantan Selatan	Amuntai								1		1982	82	LEN	& TVRO	
317		Kalimantan Selatan	Tanjung					4			0.05		1985	86		TVRO	
318		Kalimantan Selatan	Tanjung					4			0.1		1985	89		TVRO	
319	19	Kalimantan Tengah	Palangkaraya	113E55	2S12	20	100	8		H	10	110	1977	77	PYE	SBS	PERUMTEL

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320		Kalimantan Tengah	Palangkaraya								10		1977	77	PYE		
321		Kalimantan Tengah	Pangkalan Bun	111E37	2S42	20	85	6		H	0.1	2.1	1982	83	LEN	TVRO	
322		Kalimantan Tengah	Pangkalan Bun								0.1		1982	83	LEN		
323		Kalimantan Tengah	Muara Teweh			35	65	6		H	0.3		1984	84	LEN	TVRO	
324		Kalimantan Tengah	Sampit			3	65	6		H	0.1		1987	87	LEN	TVRO	
325		Kalimantan Tengah	Sampit								0.1		1987	88	LEN		
326		Kalimantan Tengah	Buntok			25	40	4		H	0.1		1987	88	LEN	TVRO	
327		Kalimantan Tengah	Buntok								0.1		1987	88	LEN		
328		Kalimantan Timur	Balikpapan	116E51	1S14	85	66	9		H	1		1973	82	LEN	STO&SBB	
329		Kalimantan Timur	Balikpapan								1		1973	84	LEN		
330		Kalimantan Timur	G.Palaran	117E11	0S49	223	64	6		H	0.6		1973	73	SIEMENS	off air	Balikpapan
331		Kalimantan Timur	G.Palaran								1		1973	82	LEN		
332		Kalimantan Timur	G.Palaran								1		1973	84	LEN		
333		Kalimantan Timur	Samarinda	117E08	0S27	116	21	4		H	0.1		1977	77	LEN	off air	G.Palaran
334		Kalimantan Timur	Samarinda								0.1		1977	77	LEN		
335		Kalimantan Timur	Badak	117E23	0S21	20	20	4		H	0.1		1977	77	JRC	off air	G.Palaran
336		Kalimantan Timur	Bontang	117E28	0N04	10	80	7		H	0.1		1977	77	JRC	TVRO &	Badak
337										H						off air	
338		Kalimantan Timur	Tarakan	117E35	3N16	50	100	4		H	1		1977	82	SIEMENS	SBB	
339		Kalimantan Timur	Tarakan								1		1977	82	SIEMENS		
340		Kalimantan Timur	Tarakan								0.1		1977	78	LEN		
341		Kalimantan Timur	Tanjung Redeb	117E29	2N09	40	85	9		H	0.1	0.5	1982	83	LEN	TVRO	
342		Kalimantan Timur	Tanjung Redeb								0.1		1982	83	LEN		
343		Kalimantan Timur	Tanah Grogot	116E12	1S54	15	65	7		H	0.1	1.8	1982	82	LEN	TVRO	
344		Kalimantan Timur	Tanah Grogot								0.1		1982	82	LEN		
345		Kalimantan Timur	Nunukan	117E39	4S09	10	65	6		H	1	9	1982	82	LEN	TVRO	
346		Kalimantan Timur	Nunukan								1		1982	82	LEN		
347		Kalimantan Timur	Melak	115E49	0S14	40	65	9		H	0.3		1985	85	LEN	TVRO	
348		Kalimantan Timur	Melak								0.3		1985	85	LEN		
349		Kalimantan Timur	Pulau Sebatik			20	40	11		H	0.1		1986	87	LEN	TVRO	
350		Kalimantan Timur	Pulau Sebatik								0.1		1986	88	LEN		
351	21	Sulawesi Utara	Manado	124E51	1N30	40	100	9		H	1	3.5	1976	76	THOMSON	STO,SBB	
352		Sulawesi Utara	Manado								1		1976	76	THOMSON		
353		Sulawesi Utara	Makaweimben	124E57	1N18	1080	85	5		H	5	98	1977	77	THOMSON	off air	Manado
354		Sulawesi Utara	Makaweimben								5		1977	77	THOMSON		
355		Sulawesi Utara	Tahuna	125E31	3N38	520	65	7		H	1	11.8	1983	83	LEN	off air,	Manado
																TVRO	
356		Sulawesi Utara	Tahuna								1		1983	83	LEN	& TVRO	
357		Sulawesi Utara	Gorontalo	121E53	0N32	20	85	4		H	0.3	0.9	1980	80	LEN	TVRO	PERUMTEL
358		Sulawesi Utara	Gorontalo								0.3		1980	82	LEN		
359		Sulawesi Utara	Kotamubagu	124E18	0N46	210	65	7		H	0.1	1.6	1981	81	LEN	SBK Cosi	
																te	
360		Sulawesi Utara	Kotamubagu								0.1		1981	82	LEN		
361		Sulawesi Utara	Lirung			7	40	5			0.1		1986	87	LEN	TVRO	
362		Sulawesi Utara	Lirung								0.1		1986	88	LEN		
363		Sulawesi Utara	Paguyaman			110	40	7			0.1		1987	87	LEN	TVRO	
364		Sulawesi Utara	Paguyaman								0.1		1987	88	LEN		
365		Sulawesi Utara	Marisa			75	40	5			0.1		1989	89	LEN	TVRO	
366		Sulawesi Utara	Marisa								0.1		1989	89	LEN		
367	22	Sulawesi Tengah	Palu	119E51	0S54	5	100	5		H	1	5.2	1977	77	THOMSON	SBS	
368		Sulawesi Tengah	Palu								1		1977	77	THOMSON		
369		Sulawesi Tengah	Poso	120E46	1S24	75	65	9		H	0.1	2.3	1981	82	LEN	TVRO	
370		Sulawesi Tengah	Poso								0.1		1981	82	LEN		
371		Sulawesi Tengah	Donggala	119E44	0S40	55	25	9		H	0.05		1983	84	LEN	off air	Palu
372		Sulawesi Tengah	Donggala								0.05		1983	84	LEN		

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373		Sulawesi Tengah	Luwuk	122E48	0S56	25	65	6		H	0.3	1.8	1981	82	LEN	TVRO	
374		Sulawesi Tengah	Luwuk								0.3		1981	82	LEN		
375		Sulawesi Tengah	Toli- Toli	120E48	1N04	10	65	4		H	0.05		1982	82	LEN	SBK Cosi tc	
376		Sulawesi Tengah	Toli- Toli								0.05		1982	82	LEN		
377		Sulawesi Tengah	Parigi/Toboli	120E05	0S49	5	85	7		H	0.3		1983	83	LEN	TVRO	
378		Sulawesi Tengah	Parigi/Toboli								0.3		1983	83	LEN		
379		Sulawesi Tengah	Sausu			65	40	11			0.1		1989	89	LEN	TVRO	
380		Sulawesi Tengah	Sausu								0.1		1989	89	LEN		
381		Sulawesi Tengah	Tinombo			35	40	9			0.1		1989	89	LEN	TVRO	
382		Sulawesi Tengah	Tinombo								0.1		1989	89	LEN		
383		Sulawesi Tengah	Banggai			110	40	4			0.1		1989	89	LEN	TVRO	
384		Sulawesi Tengah	Banggai								0.1		1989	89	LEN		
385	23	Sulawesi Tenggara	Kendari	122E33	3S53	20	100	9		H	1	12.6	1976	77	THOMSON	SBS	PERUMTEL
386		Sulawesi Tenggara	Kendari								1		1976	77	THOMSON		
387		Sulawesi Tenggara	Pomala	121E37	4S04	63	60	4		H	0.1		1978	78	LEN	TVRO	
388		Sulawesi Tenggara	Pomala								0.3		1978	84	LEN		
389		Sulawesi Tenggara	Bau-Bau	122E37	5S14	150	60	8		H	0.3		1978	79	LEN	TVRO	
390		Sulawesi Tenggara	Bau-Bau								0.3		1978	79	LEN		
391		Sulawesi Tenggara	Bau-Bau								0.3		1978	85	LEN		
392		Sulawesi Tenggara	Banabungi	122E37	5S28	15	60	6		H	0.3		1980	79	LEN	TVRO	
393		Sulawesi Tenggara	Banabungi								0.3		1980	86	LEN		
394		Sulawesi Tenggara	Raha	122E51	4S48	65	65	4		H	0.3		1982	82	LEN	TVRO	
395		Sulawesi Tenggara	Raha								0.3		1982	82	LEN		
396		Sulawesi Tenggara	Unaaha			40	65	7			0.3		1986	86	LEN	TVRO	
397		Sulawesi Tenggara	Unaaha								0.3		1986	86	LEN		
398		Sulawesi Tenggara	Wanci			95	40	4			0.1		1986	87	LEN	TVRO	
399		Sulawesi Tenggara	Wanci								0.1		1986	88	LEN		
400	24	Sulawesi Selatan	Ujung Pandang	119E27	5S06	5	75	4		H	1		1972	80	NEC	STO & SBB	PERUMTEL
401		Sulawesi Selatan	Ujung Pandang								1		1972	72	NEC		
402		Sulawesi Selatan	G.Loka	119E55	5S26	1260	45	9		H	0.1		1977	77	LEN	off air	U.Pandang
403		Sulawesi Selatan	Tanjung Butung	119E40	4S36	250	60	7		H	0.1		1977	78	LEN	off air	Makadac
404		Sulawesi Selatan	G.Makadac	119E41	3S54	250	60	9		H	1		1978	82	LEN	off air	T. Butung
405		Sulawesi Selatan	G.Makadac								1		1978	82	LEN		
406		Sulawesi Selatan	SengKang	120E02	4S08	150	60	6		H	0.3		1978	86	LEN	off air	G.Makadac
407		Sulawesi Selatan	SengKang								0.3		1978	86	LEN		
408		Sulawesi Selatan	Soroako 1	121E22	2S34	600	60	4		H	0.01		1980	80	RFC	SBK	
409		Sulawesi Selatan	Soloako 2(Wawondul a)	121E16	2S36	750	40	6		H	0.01		1981	81	RFC	off air	Soroako 1
410		Sulawesi Selatan	Bontu Tabang	119E52	3S02	1175	60	8		H	0.3		1981	86	LEN	off air	G. Makadac
411		Sulawesi Selatan	Bontu Tabang								0.3		1981	86	LEN		
412		Sulawesi Selatan	Baraka	119E50	3S22	1100	60	5		H	0.3		1981	86	LEN	off air	Bontu Taba ng.
413		Sulawesi Selatan	Baraka								0.3		1981	86	LEN		
414		Sulawesi Selatan	Sinjai	119E56	5S15	1600	85	7		H	0.1	1.8	1982	82	LEN	off air	U.Pandang
415		Sulawesi Selatan	Sinjai								0.1		1982	82	LEN		
416		Sulawesi Selatan	Palopo	120E12	3S00	15	85	7		H	0.1	1.2	1982	82	LEN	SBK Cosi tc	
417		Sulawesi Selatan	Palopo								0.1		1982	82	LEN		
418		Sulawesi Selatan	Mamuju			150	40	4			0.3		1986	86	LEN	TVRO	
419		Sulawesi Selatan	Mamuju								0.1		1986	88	LEN		
420	25	Maluku	Ambon(G.Nona)	128E09	3S42	120	45	SHF			0.001		1976	77	THOMSON	SBB	PERUMTEL
421		Maluku	Ambon(G.Nona)								0.001		1976	77	THOMSON		
422		Maluku	Bukit Gresir	128E10	3S43	248	100	7		H	5	68	1976	77	THOMSON	SHF	Ambon
423		Maluku	Bukit Gresir								5		1976	77	THOMSON		
424		Maluku	Ternate	127E21	0N47	375	65	9		H	1	11.8	1978	82	LEN	TVRO	

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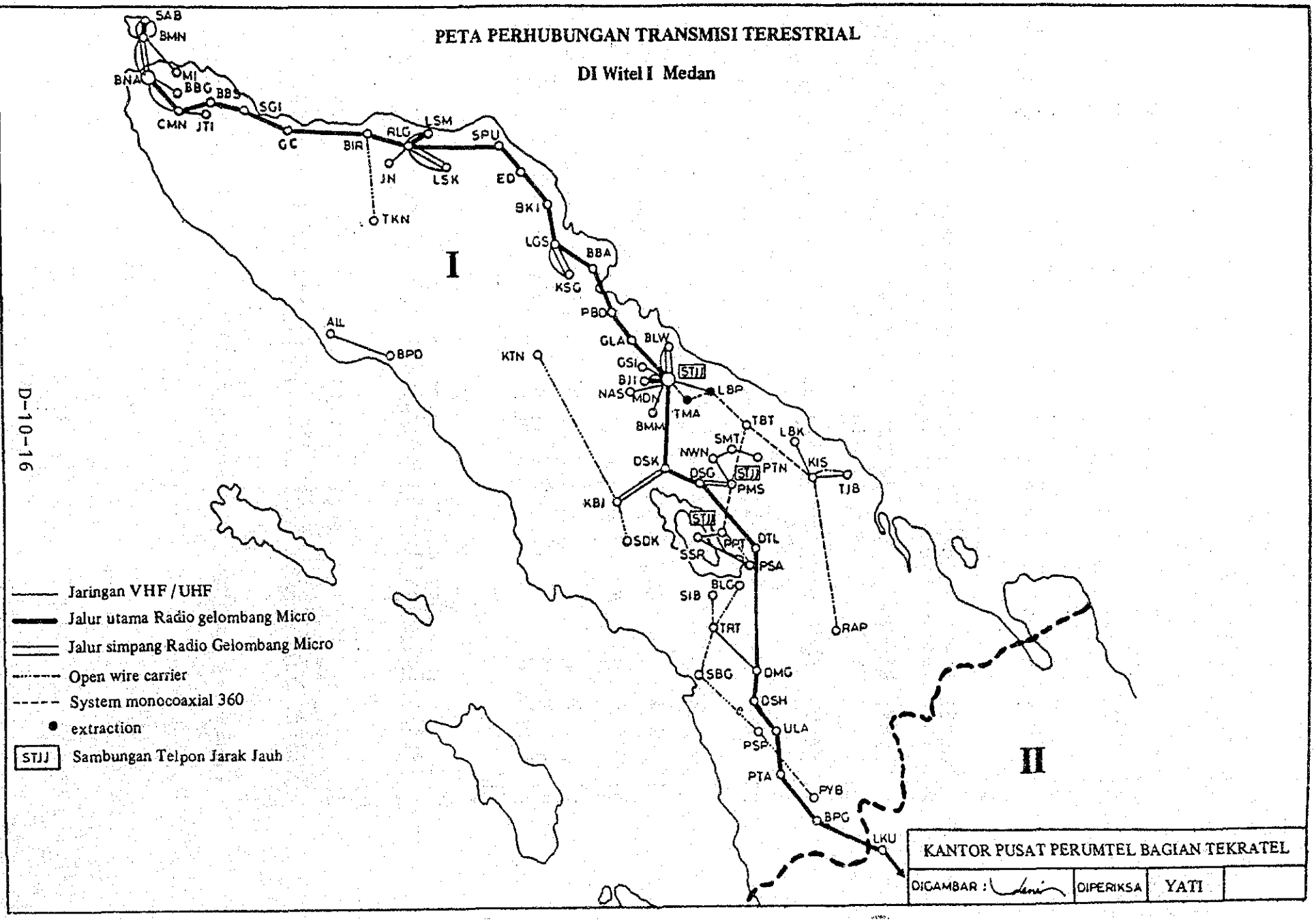
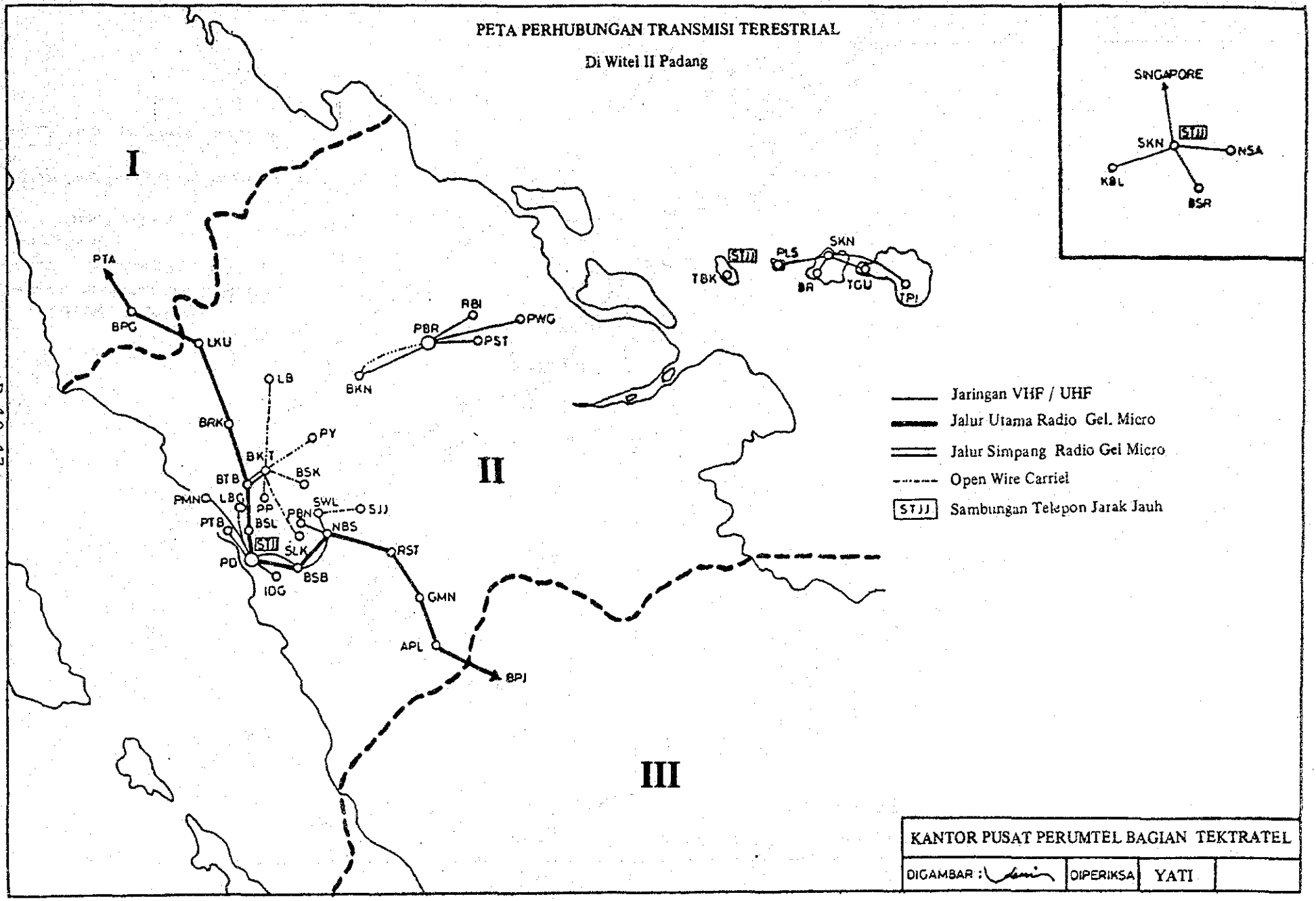
425		Maluku	Ternate								1		1978	82	LEN		
426		Maluku	Dobo	134E11	5S48	2	65	4		H	0.05	0.45	1982	82	LEN	TVRO	
427		Maluku	Dobo								0.05		1982	82	LEN		
428		Maluku	Soasiu	127E27	0N40	15	65	7		H	0.1	2.4	1982	82	LEN	TVRO	
429		Maluku	Soasiu								0.1		1982	82	LEN		
430		Maluku	Namlea	126E05	3S16	50	65	5		H	0.1	4	1982	82	LEN	SBK Cosi tc	
431		Maluku	Namlea								0.1		1982	82	LEN		
432		Maluku	Tual	132E46	5S38	50	65	8		H	0.1	0.3	1983	83	LEN	TVRO	
433		Maluku	Tual								0.1		1983	83	LEN		
434		Maluku	Morotai			5	40	7			0.05		1983	83	LEN	TVRO	
435		Maluku	Morotai								0.05		1983	83	LEN		
436		Maluku	Pulau Gebe										1983	83	RFC	TVRO	
437		Maluku	Saumlaki			42	40	4			0.1		1986	87	LEN	TVRO	
438		Maluku	Saumlaki								0.1		1986	88	LEN		
439		Maluku	Sanana			2	40	4			0.1		1986	87	LEN	TVRO	
440		Maluku	Sanana								0.1		1986	88	LEN		
441	26	Irian Jaya	Jayapura	140E13	8S39	100	45	SHF		H	0.001		1977	76	THOMSON	SBB	
442		Irian Jaya	Jayapura								0.001		1977	76	THOMSON		
443		Irian Jaya	G.Polemak	140E43	2S33	130	100	5		H	1	5.2	1977	76	THOMSON	SHF	Jayapura
444		Irian Jaya	G.Polemak								1		1977	76	THOMSON		
445		Irian Jaya	Sorong	131E16	0S52	70	65	4		H	0.1	0.9	1978	82	LEN	TVRO	
446		Irian Jaya	Sorong								0.1		1979	83	LEN		
447		Irian Jaya	Manokwari	134E01	0S53	90	40	6		H	0.3		1979	79	LEN	SBK	
448		Irian Jaya	Manokwari								0.3		1979	79	LEN		
449		Irian Jaya	Wamena	140E22	8S30	2000	40	4		H	0.05		1980	86	LEN	TVRO	
450		Irian Jaya	Merauke	140E22	8S30	10	65	6		H	0.3	0.56	1981	84	LEN	TVRO	
451		Irian Jaya	Merauke								0.3		1981	84	LEN		
452		Irian Jaya	Tembaga Pura	137E06	4S10		30	5		H	0.01		1979	79	LEN	SBK	
453		Irian Jaya	Tembaga Pura								0.01		1979	79	LEN		
454		Irian Jaya	Biak	136E06	1S12	70	65	4		H	0.3		1978	82	LEN	TVRO	
455		Irian Jaya	Biak								0.3		1978	82	LEN		
456		Irian Jaya	Fak-Fak	132E19	2S36	175	65	6		H	0.1	0.2	1982	82	LEN	TVRO	
457		Irian Jaya	Fak-Fak								0.1		1982	82	LEN		
458		Irian Jaya	Serui	135E09	1S47	10	65	6		H	0.1	1.2	1982	82	LEN	SBK	
459		Irian Jaya	Serui								0.1		1982	83	LEN		
460		Irian Jaya	Nabire	135E30	3S21	20	27	7		H	0.3		1982	82	LEN	TVRO	
461		Irian Jaya	Sentani	140E32	2S33	410	65	7		H	0.05		1983	84	LEN	off air, G. Polemak TVRO	
462		Irian Jaya	Sentani								0.05		1983	84	LEN	& TVRO	
463		Irian Jaya	Tanah Merah			30	40	9			0.1		1986	87	LEN	TVRO	
464		Irian Jaya	Tanah Merah								0.1		1986	88	LEN		
465	27	Timor Timur	Dilli	125E35	8S32	200	40	4		H	0.1		1978	78	LEN	TVRO	
466		Timor Timur	Dilli								0.1		1978	78	LEN		
467		Timor Timur	Dilli								0.3		1978	86	LEN		
468		Timor Timur	Maliana	125E18	9S01		30	7		H	0.01		1978	78	LEN	TVRO	
469		Timor Timur	Maliana								0.01		1978	86	LEN		
470		Timor Timur	Los Palos	127E01	8S31		30	4		H	0.01		1978	79	LEN	TVRO	
471		Timor Timur	Los Palos								0.01		1978	86	LEN		
472		Timor Timur	Baukau	126E25	8S28		30	8		H	0.05		1978	79	LEN	TVRO	
473		Timor Timur	Baukau								0.05		1978	79	LEN		
474		Timor Timur	Suai	124E16	9S20		30	9		H	0.05		1979	79	LEN	TVRO	
475		Timor Timur	Suai								0.05		1979	86	LEN		
476		Timor Timur	Vikeke	126E19	8S54		30	7		H	0.05		1979	79	LEN	TVRO	
477		Timor Timur	Vikeke								0.05		1979	86	LEN		
478		Timor Timur	Ockusi	124E20	9S13	50	65	4		H	0.1		1986	86	LEN	TVRO	
479		Timor Timur	Ockusi								0.1		1986	86	LEN		


PETA PERHUBUNGAN TRANSMISI TERESTRIAL
DI Witel I Medan
D-10-16
I
II
SAB
BMN
MI
BNA
BBG
BBS
SGI
CMN
JTI
GC
BIR
RLG
LSM
SPU
JN
LSK
ED
TKN
BKI
LGS
BBA
KSG
PBO
GLA
BLW
GSI
BJI
NAS
MDN
TMA
BMM
STJJ
LBP
TBT
LBK
SMT
NWN
PTN
KIS
TJB
DSK
DSG
PMS
KBJ
OSDK
PPT
DTL
SSR
PSA
BLG
SIB
TRT
RAP
SBG
DMG
DSH
ULA
PSP
PTA
PYB
BPG
LKU
AIL
BPD
KTN
Jaringan VHF / UHF
Jalur utama Radio gelombang Micro
Jalur simpang Radio Gelombang Micro
Open wire carrier
System monocoaxial 360
extraction
STJJ Sambungan Telpon Jarak Jauh
KANTOR PUSAT PERUMTEL BAGIAN TEKRATEL
DIGAMBAR :
DIPERIKSA
YATI

PETA PERHUBUNGAN TRANSMISI TERESTRIAL

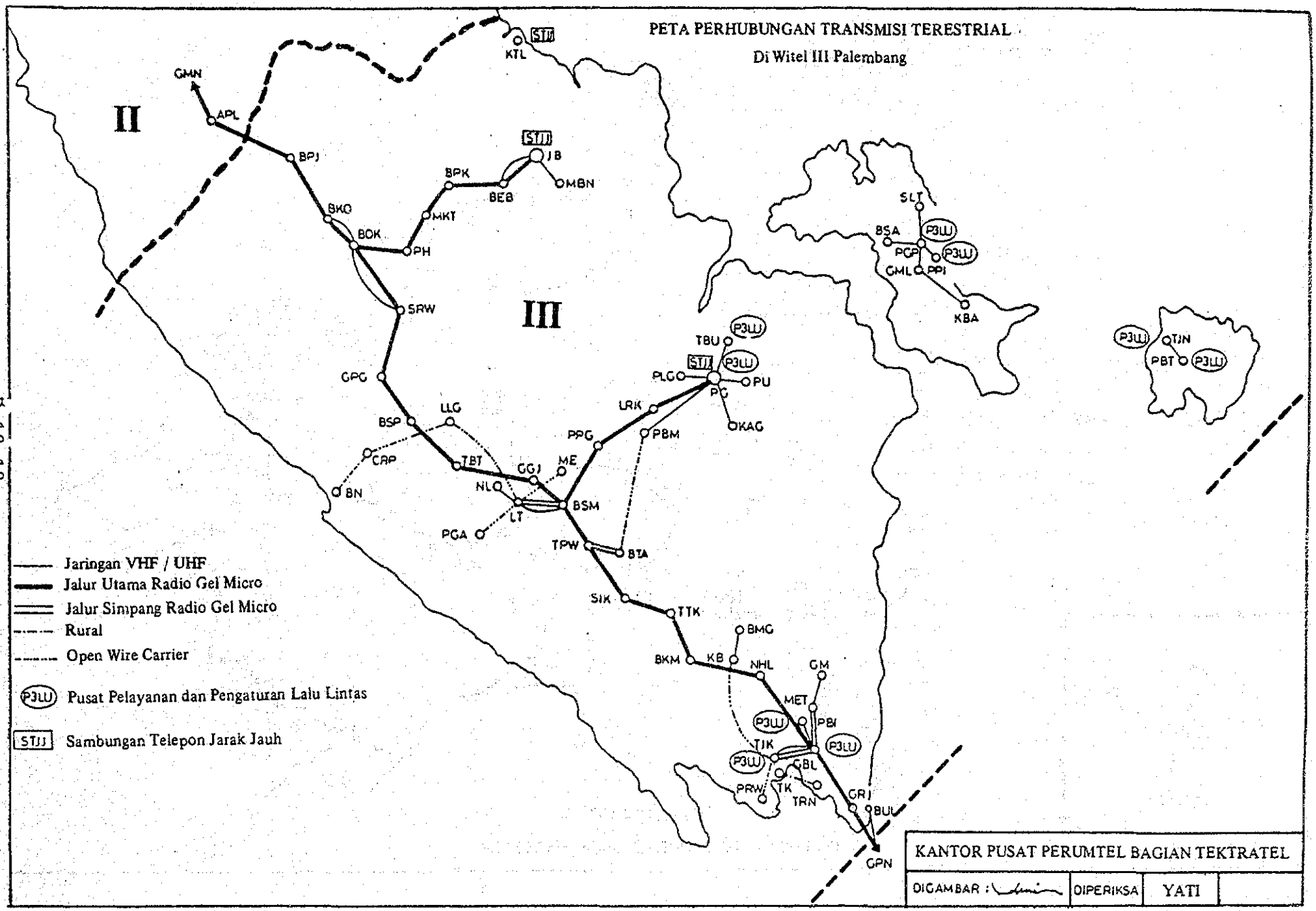
Di Witel II Padang



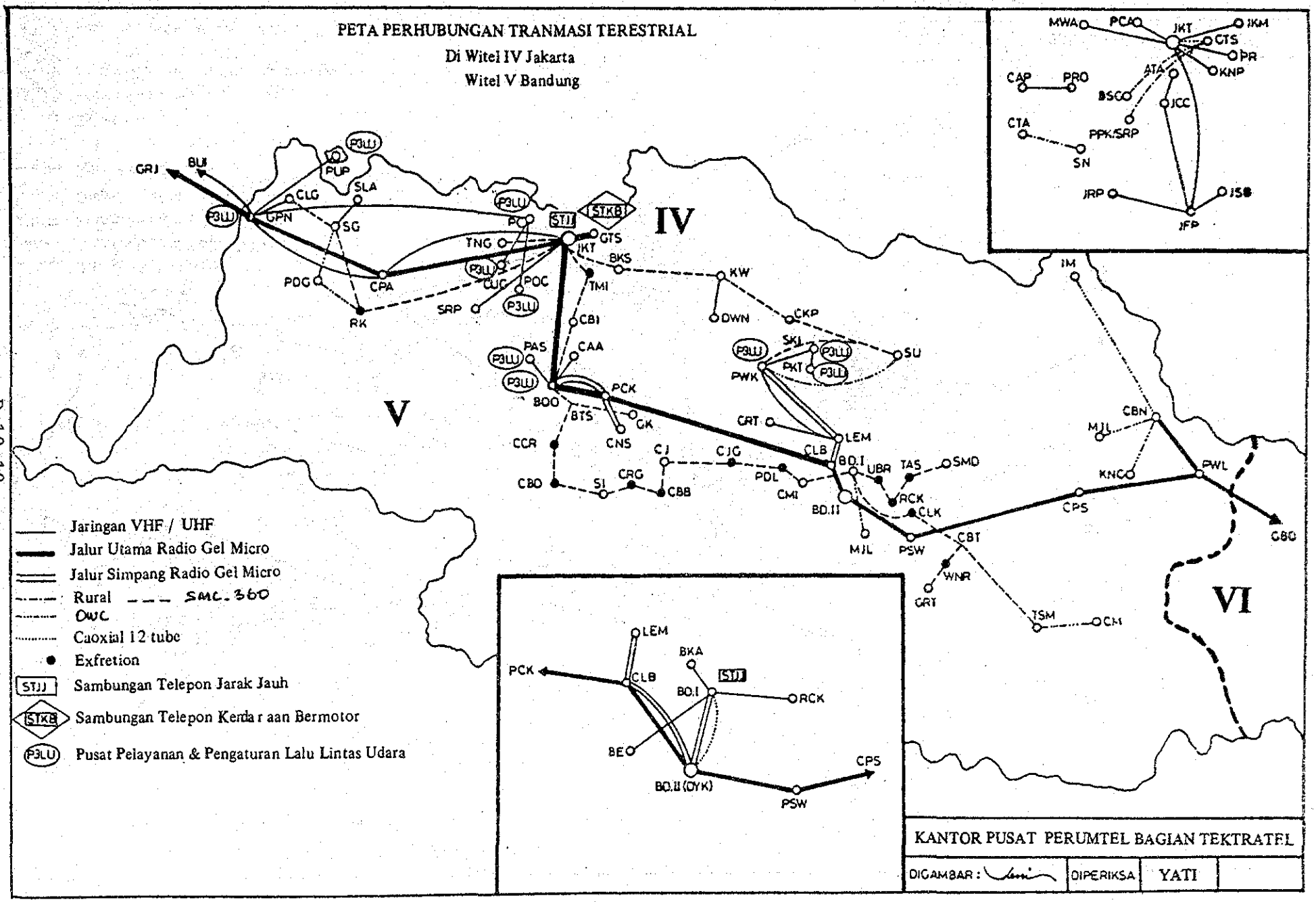
KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL			
DIGAMBAR :		DIPERIKSA	YATI

PETA PERHUBUNGAN TRANSMISI TERESTRIAL

Di Witel III Palembang



KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL			
DIGAMBAR :	DIPERIKSA	YATI	

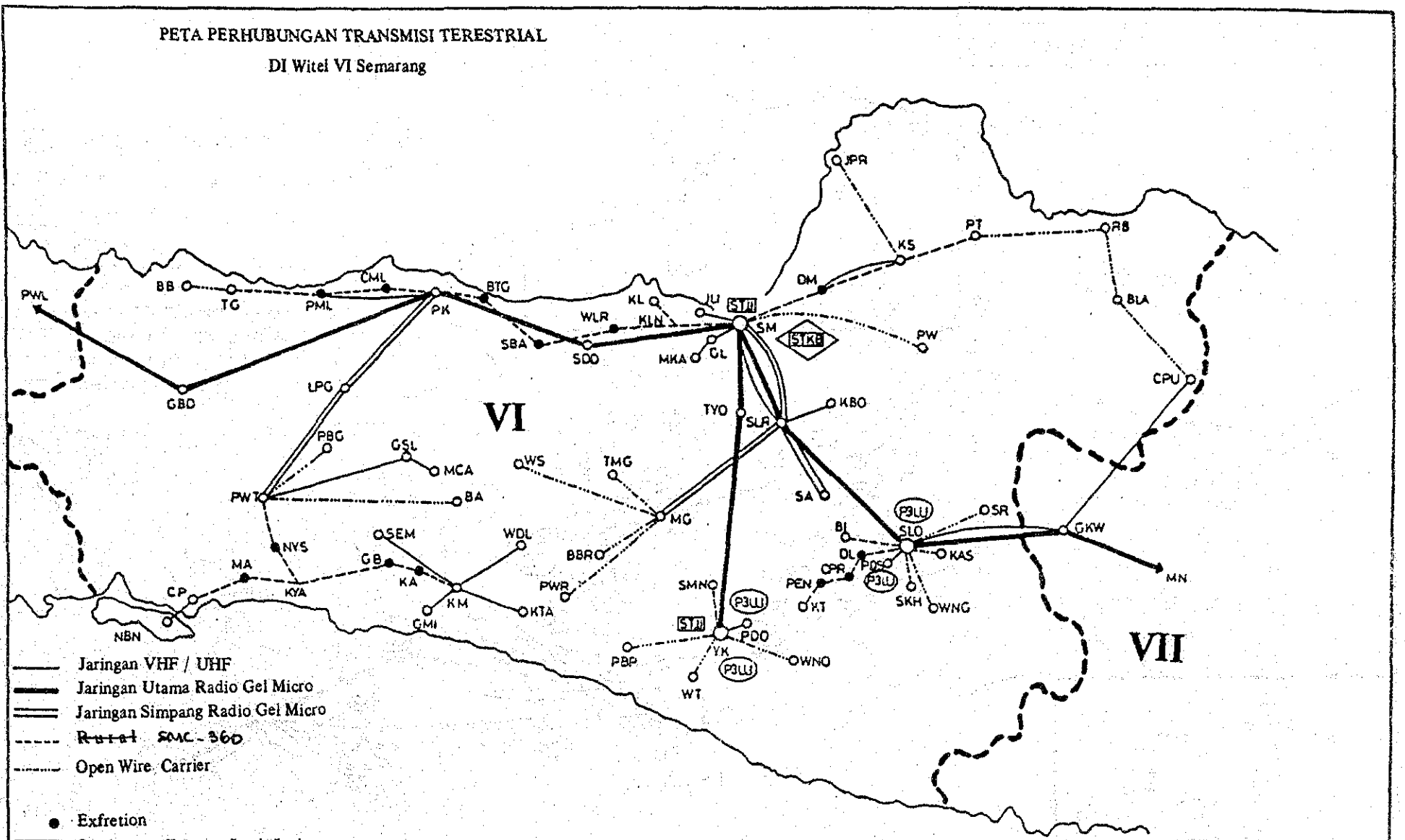

PETA PERHUBUNGAN TRANMASI TERESTRIAL
Di Witel IV Jakarta
Witel V Bandung
IV
V
VI
GRJ
BUI
PUP
CLG
SLA
GPN
SG
CPA
PDG
RK
SRP
POC
TNG
GTS
JKT
BKS
TMI
CBI
KW
DWN
CKP
SU
PAS
CAA
BOO
PCK
BTS
GK
CNS
CCR
CBO
SI
CRG
CBB
CJ
CJG
PDL
CMI
CRT
LEM
CLB
BD.I
UBR
TAS
SMD
RCK
CLK
BD.II
MJL
PSW
CBT
WNR
GRT
TSM
CM
IM
CBN
MJL
KNC
PWL
CPS
GBO
MWA
PCA
IKM
CTS
PR
KNP
ATA
CAP
PRO
BSC
JCC
CTA
PPK/SRP
SN
JRP
JSB
JFP
BKA
BE
BD.II (OYK)
Jaringan VHF / UHF
Jalur Utama Radio Gel Micro
Jalur Simpang Radio Gel Micro
Rural SMC-360
OWC
Caoxial 12 tube
Exfretion
STJJ Sambungan Telepon Jarak Jauh
STKB Sambungan Telepon Kendaraan Bermotor
P3LU Pusat Pelayanan & Pengaturan Lalu Lintas Udara
KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL
DIGAMBAR :
DIPERIKSA
YATI

D-10-19

D-10-20

PETA PERHUBUNGAN TRANSMISI TERESTRIAL

DI Witel VI Semarang



Jaringan VHF / UHF

Jaringan Utama Radio Gel Micro

Jaringan Simpang Radio Gel Micro

~~Rural~~ SMC-360

Open Wire Carrier

Exfretion

STJJ Sambungan Telepon Jarak Jauh

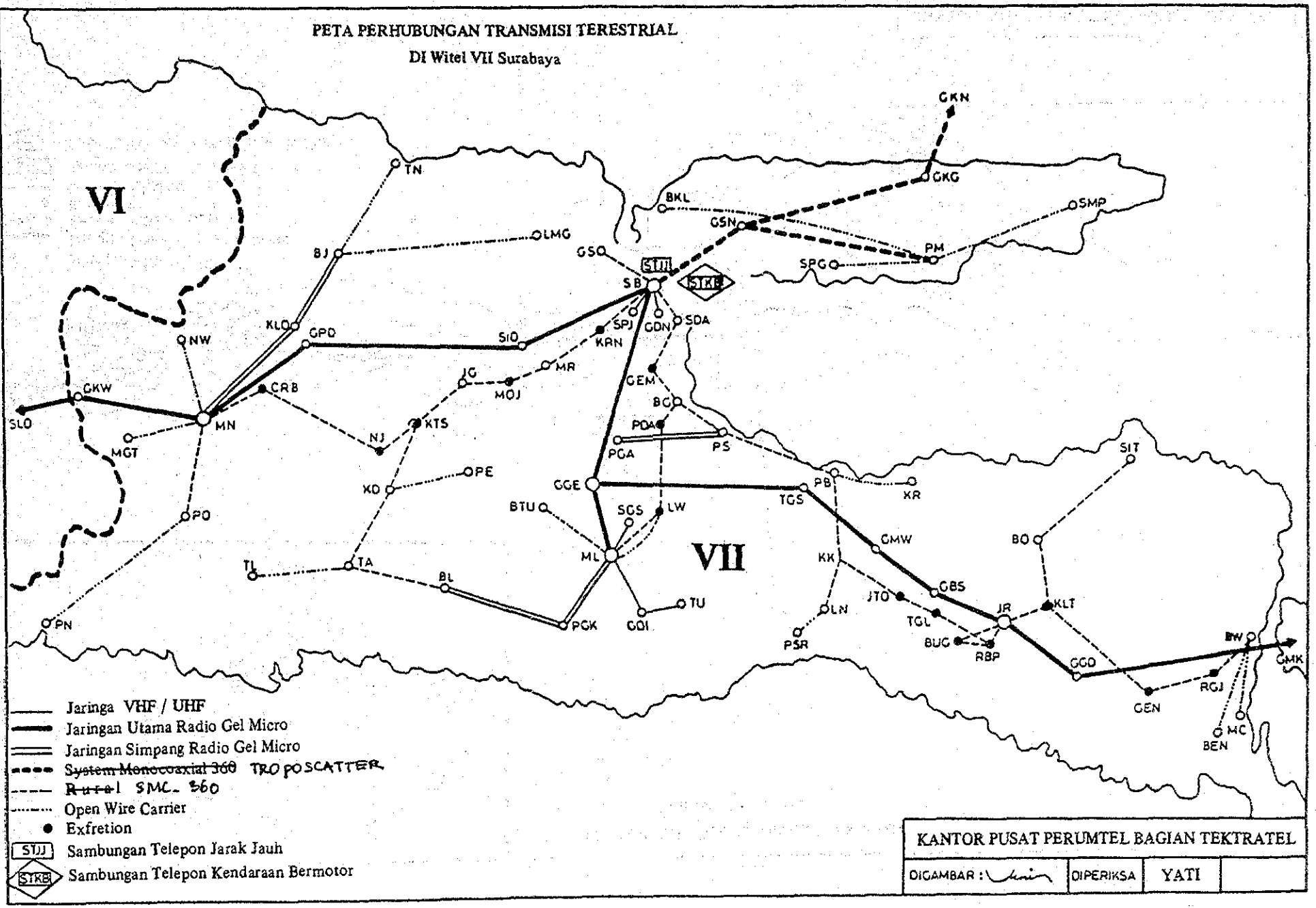
STKB Sambungan Telepon Kendaraan Bermotor

P3LU Pusat Pelayanan & Penganturan Lalu Lintas

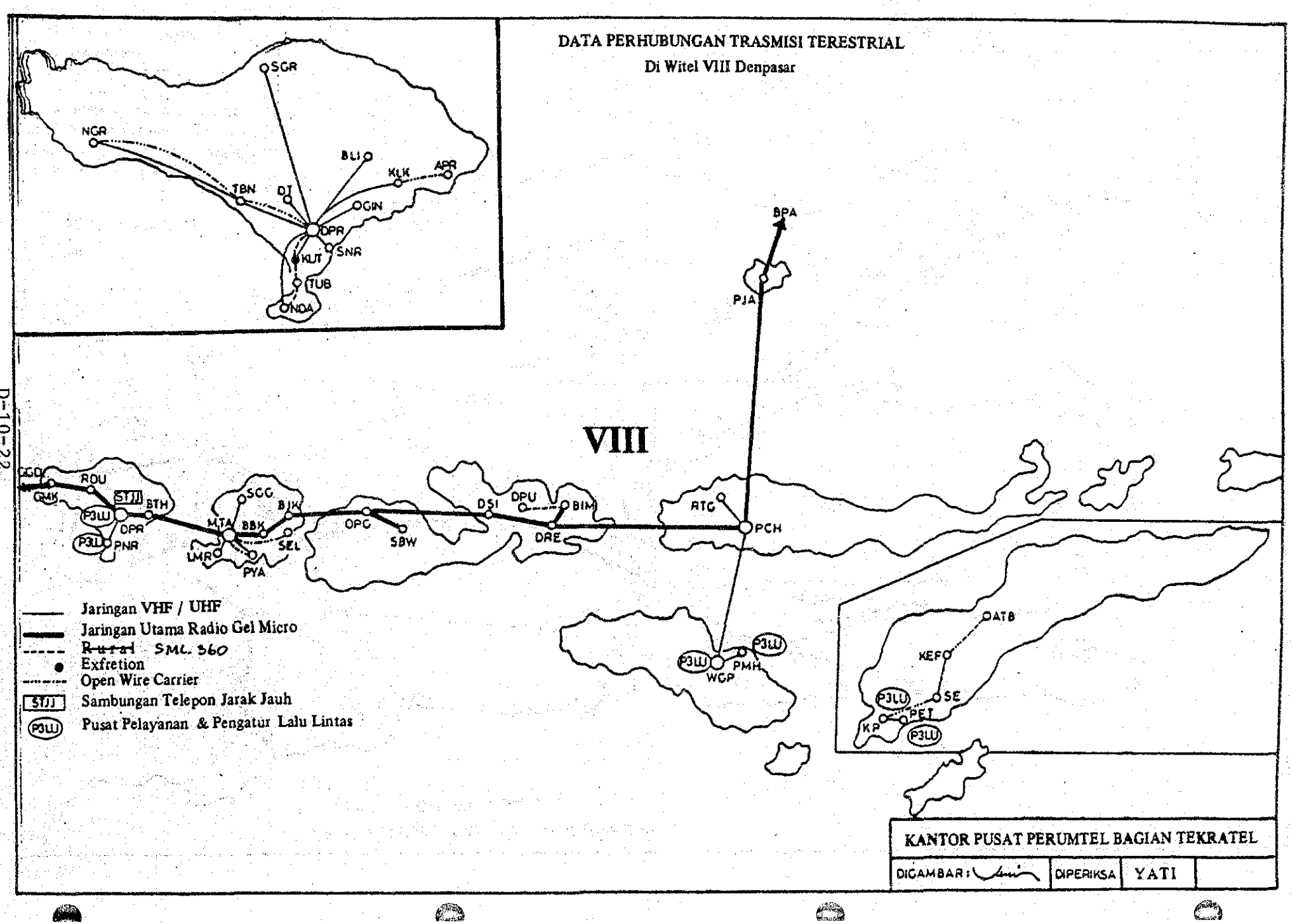
KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL			
DIGAMBAR :	DIPERIKSA	YATI	

PETA PERHUBUNGAN TRANSMISI TERESTRIAL

DI Witel VII Surabaya



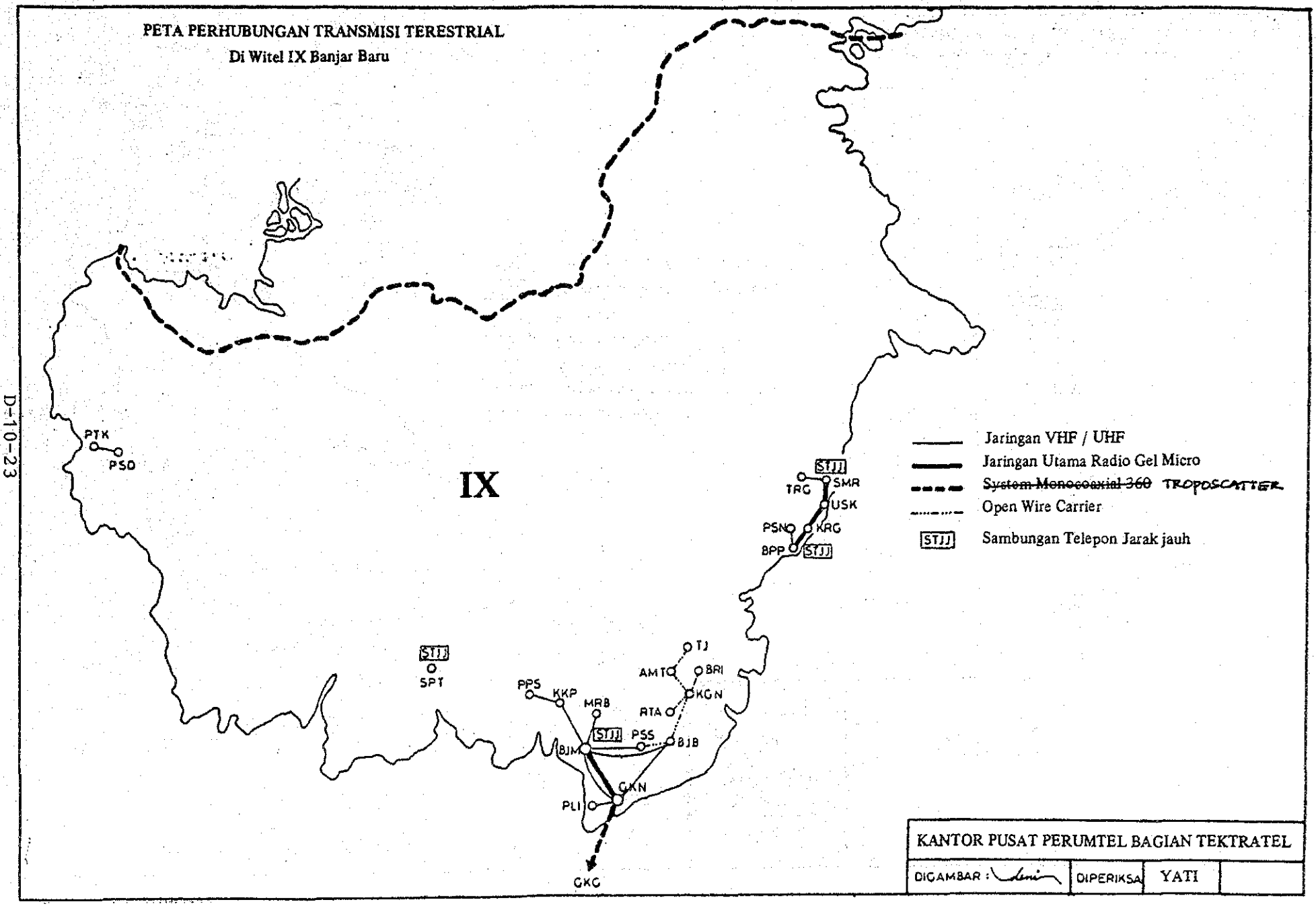
KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL			
DIGAMBAR :	DIPERIKSA	YATI	


DATA PERHUBUNGAN TRASMISI TERESTRIAL
Di Witel VIII Denpasar
VIII
SGR
NGR
BLI
KLK
APR
TBN
DJ
GIN
DPR
SNR
KUT
TUB
NOA
BPA
PJA
SGD
ROU
GRK
STJJ
BTH
P3LU
DPR
P3LU
PNR
SCG
BJK
MTA
BBK
SEL
UMR
PYA
OPC
SBW
DSI
DPU
BIM
DRE
ATG
PCH
P3LU
P3LU
PMH
WGP
ATB
KEF
P3LU
SE
PET
KP
P3LU
Jaringan VHF / UHF
Jaringan Utama Radio Gel Micro
Rural SML. 560
Exfretion
Open Wire Carrier
STJJ Sambungan Telepon Jarak Jauh
P3LU Pusat Pelayanan & Pengatur Lalu Lintas
KANTOR PUSAT PERUMTEL BAGIAN TEKRATEL
DIGAMBAR :
DIPERIKSA
YATI

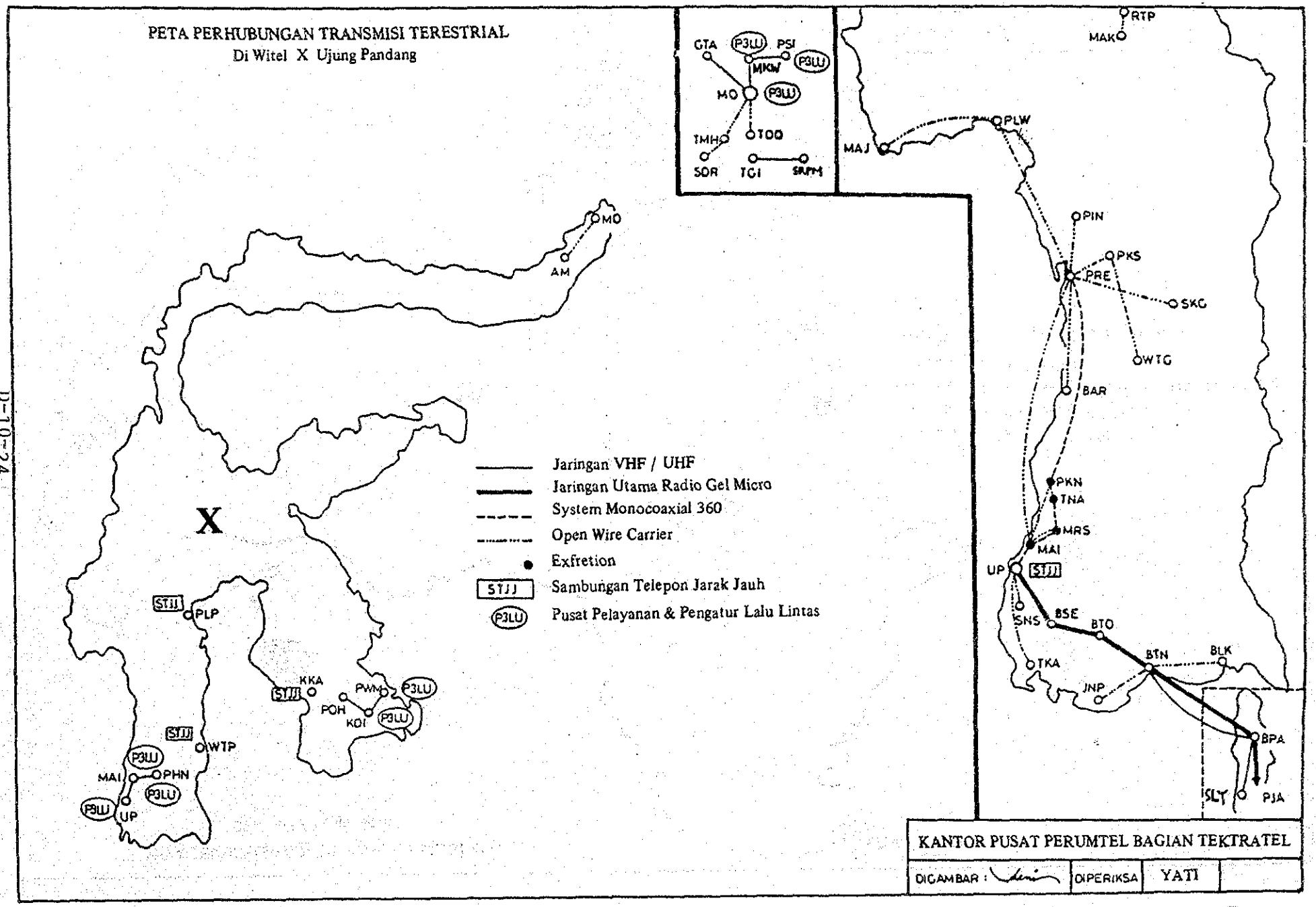
D-10-22

PETA PERHUBUNGAN TRANSMISI TERESTRIAL

Di Witel IX Banjar Baru



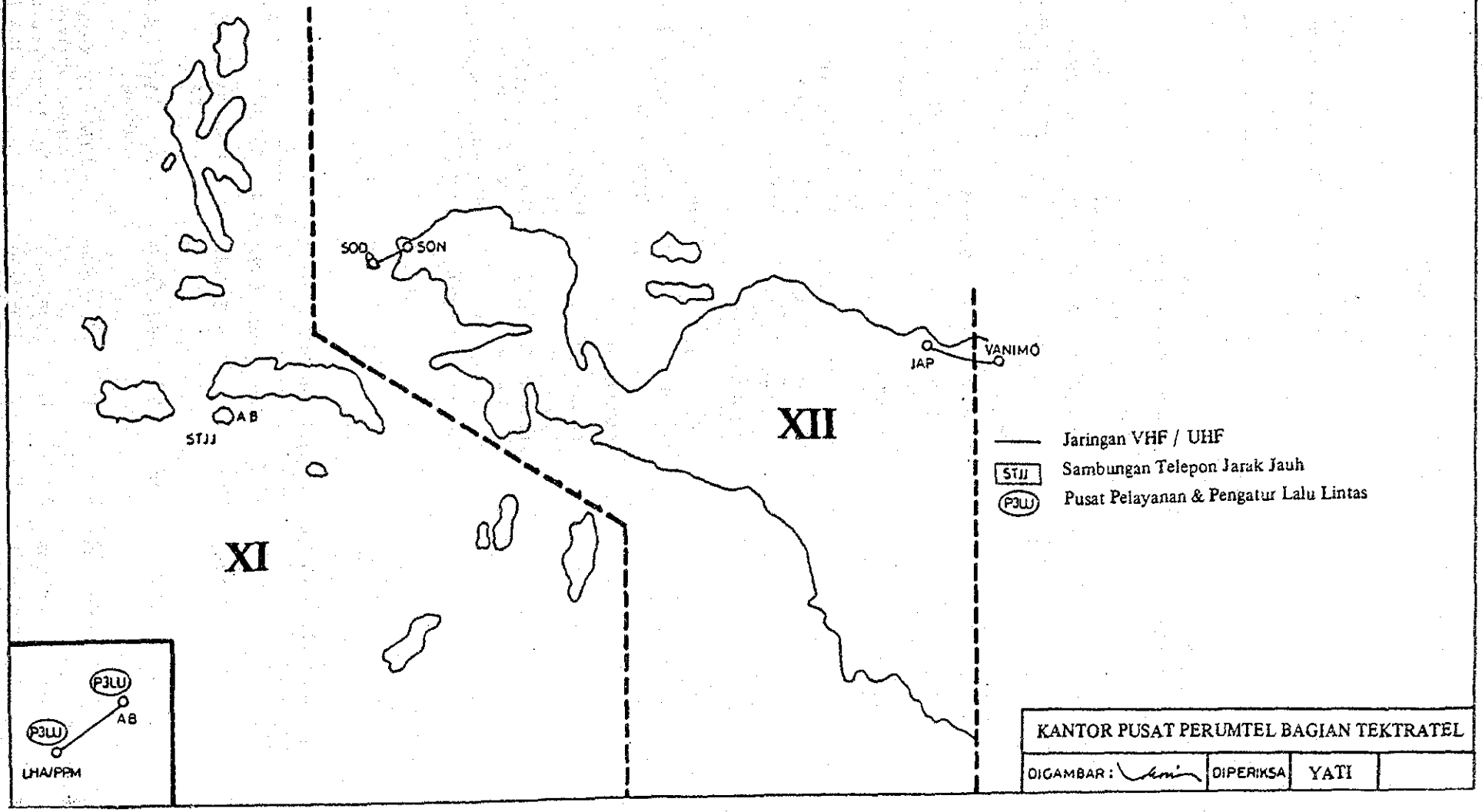
KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL			
DIGAMBAR :		DIPERIKSA	YATI


PETA PERHUBUNGAN TRANSMISI TERESTRIAL
Di Witel X Ujung Pandang
D-10-24
GTA
P3LU
PSI
P3LU
MKW
MO
P3LU
TMH
TOO
SOR
TGI
SRPM
RTP
MAK
MAJ
PLW
PIN
PKS
PRE
SKG
WTG
BAR
PKN
TNA
MRS
MAI
UP
STJJ
SNS
BSE
BTO
BTN
BLK
TKA
JNP
BPA
SLT
PJA
MO
AM
X
STJJ
PLP
KKA
STJJ
PWM
P3LU
POH
KOI
P3LU
STJJ
WTP
P3LU
MAI
PHN
P3LU
P3LU
UP
Jaringan VHF / UHF
Jaringan Utama Radio Gel Micro
System Monocoaxial 360
Open Wire Carrier
Exfretion
STJJ
Sambungan Telepon Jarak Jauh
P3LU
Pusat Pelayanan & Pengatur Lalu Lintas
KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL
DIGAMBAR :
DIPERIKSA
YATI

PETA PERHUBUNGAN TRANSMISI TERESTRIAL

Witel XI Ambon

Witel XII Jayapura



KANTOR PUSAT PERUMTEL BAGIAN TEKTRATEL			
DIGAMBAR :	DIPERIKSA	YATI	

Palapa B1 *(Indonesia)*

108° East

For a detailed description of the Palapa satellite system, refer to Chapter 8 in Part One.

Palapa B1 at a Glance

Operational History

Launch Date(s):	June 18, 1983
Launch Vehicle(s):	NASA space shuttle
Orbital Assignment(s):	108° east longitude
Status:	Primary operational communications satellite for the Palapa system
Design Life:	8 years, 2 months

Communications Payload

Frequency Band(s):	Receive: 5.925–6.425 Transmit: 3.700–4.200
Channels:	24
Bandwidth(s):	36 MHz
Polarization:	Horizontal & vertical
Antenna Coverage:	ASEAN countries
Signal Power (EIRP): (Minimum within intended coverage area)	34 dBW
TWTA Power:	10 watts
Capacity:	24,000 one-way voice circuits or 24 color TV channels

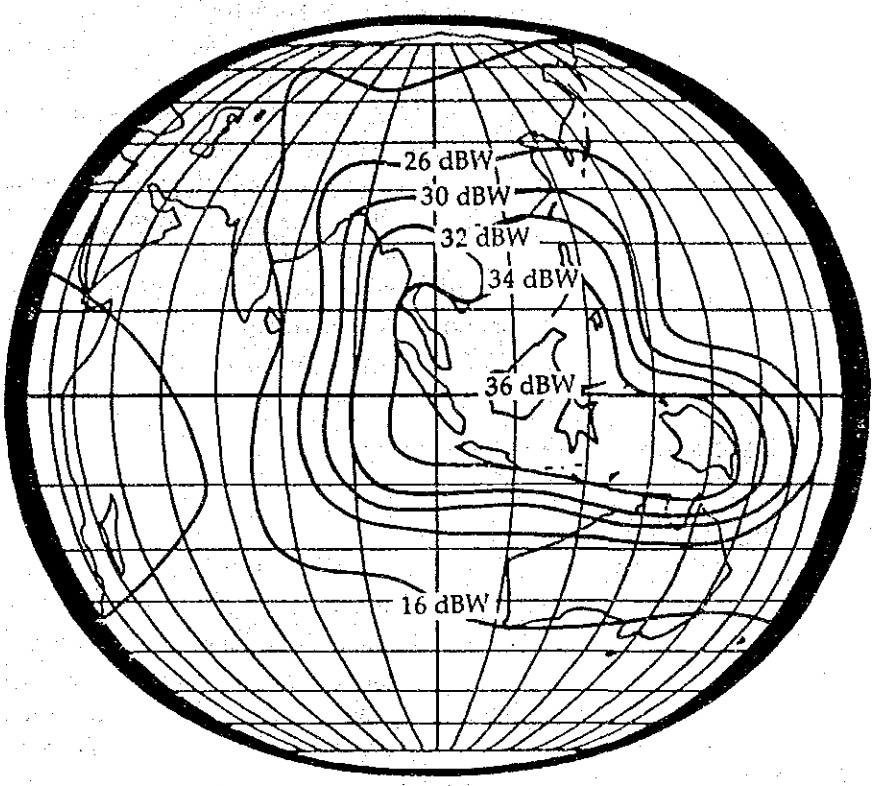
Spacecraft

Satellite Type:	Hughes HS 376 spin-stabilized
Mass in Orbit:	1433 lbs (650 kg)
Maximum Deployed Dimensions:	22 feet 5 inches (6.8 m) in height, 7 feet 1 inch (2.2 m) in diameter
Electrical Power:	1062 watts at beginning of life
Telemetry Beacon(s):	4.197 GHz

Palapa B1 TV Channel Assignment Plan

Tr.#	*Beam*	*Tr. Type*	*Pol.*	*Uplink/Downlink*	*Service*	*Audio*
8A	Spot Beam	Half	V	6075/3850	TBS 7 TV, Bangkok, Thailand	SCPC (on Tr.#18)
8B	Spot Beam	Half	V	6095/3870	Army TV, Bangkok, Thailand	SCPC (on Tr.#18)
10	Spot Beam	Full	V	6125/3900	RTM 1 TV, Kuala Lumpur, Malaysia	6.8 MHz
15	Spot Beam	Full	H	6225/4000	Turi TV, Indonesia	6.8 MHz
22	Spot Beam	Full	V	6365/4140	Occasional video feeds to east Malaysia	6.8 MHz

Palapa B1 spot beam.



Palapa B Carrier Parameters for TV News Exchange Service

Maximum Earth Station Carrier	*Maximum Satellite Bandwidth*	*Power*	*EIRP*
TV	36 MHz	31 dBW	36.5 dBW
SCPC/60	25 kHz	9.7 dBW	7.6 dBW
SCPC/45	20 kHz	8.5 dBW	5.8 dBW
SCPC/30	20 kHz	6.7 dBW	4.6 dBW
SCPC/22.5	19 kHz	5.5 dBW	2.8 dBW

Palapa B2P *(Indonesia)*

113° East

Palapa B2P was launched by a NASA Delta rocket on March 20, 1987. The satellite will serve as an in-orbit spare for the Palapa B1 satellite. Originally, the Palapa B2 satellite that was launched in February 1985 was to have served as the initial in-orbit spare for the Palapa system. However, Palapa B2 failed to reach its proper orbit because of a malfunction in its perigee kick motor. Following the failure of the McDonnell Douglas payload assist module (PAM), Palapa B2 was sent into a low-Earth orbit. Palapa B2 was later retrieved by a NASA space shuttle and has been refurbished by Hughes Aircraft for resale. At the time of publication, the insurance underwriters were in the process of negotiating the sale of Palapa B2 to an unidentified buyer.

ITU Region 3

Palapa B2P at a Glance

Operational History

Launch Date(s):	March 20, 1987
Launch Vehicle(s):	NASA Delta rocket
Orbital Assignment(s):	113° east longitude
Status:	In-orbit spare satellite for Palapa system
Design Life:	8 years, 2 months

Communications Payload

Frequency Band(s):	Receive: 5.925–6.425 Transmit: 3.700–4.200
Channels:	24
Bandwidth(s):	36 MHz
Polarization:	Horizontal & vertical
Antenna Coverage:	ASEAN countries
Signal Power (EIRP): (Minimum within intended coverage area)	36 dBW
TWTA Power:	10 watts
Capacity:	24,000 one-way voice circuits or 24 color TV channels

Spacecraft

Satellite Type:	Hughes HS 376 spin stabilized
Mass in Orbit:	1433 lbs (650 kg)
Maximum Deployed Dimensions:	22 feet 5 inches (6.8 m) in height, 7 feet 1 inch (2.2 m) in diameter
Electrical Power:	1062 watts at beginning of life
Telemetry Beacon(s):	4.197 GHz

II. Pancaran isyarat TV melalui Satelit.

Seperti telah diuraikan diatas, batas jangkauan pancaran isyarat TV hanyalah sampai batas jarak pandang.

Indonesia yang terdiri dari pulau-pulau, dengan jarak antara pulau yang satu dengan pulau yang lain sebagian besar berada diluar jarak pandang tentulah tidak mungkin dijangkau keseluruhannya oleh siaran TV dari Jakarta dengan memakai sistem stasiun penghubung dan stasiun pengulang.

Dengan dikembangkannya Satelit Komunikasi yang telah ada untuk penggunaan siaran TV, maka jangkauan siaran TV dapat diperluas pada daerah yang sangat luas, yang secara teoritis dapat mencakup setengah bagian dunia (lihat gb. 2).

Namun dengan pertimbangan ekonomis maupun politis yang berbeda-beda di berbagai negera, maka penggunaan Satelit Komunikasi tersebut diatur penempatannya, frekwensi pancaran diangkasa serta jangkauan penyiarannya oleh Badan International yang bernama International Telecommuniation Union (ITU) yang berpusat di Geneva (Swiss).

Jangkauan siaran TV melalui Satelit yang sangat luas telah dimanfaatkan oleh Indonesia sejak bulan Juli 1976, yaitu dengan diluncurkan Satelit Domestik PALAPA. Jangkauan pancaran Satelit PALAPA meliputi daerah-daerah Indonesia, Singapura, Malaysia, Thailand, Vietnam, Philipina dan sebagian Papua Nugini, sehingga apabila dikehendaki, maka penonton TV di daerah-daerah tersebut dapat menangkap siaran TVRI dengan memasang TVRO (Television Receive Only) Unit, yang pada saat ini telah dapat dibuat di Indonesia oleh Lembaga Elektroteknika Nasional - LIPI ataupun Radio Frequency Communication (RFC) di Bandung.

Posisi Satelit PALAPA yang ditentukan dalam ITU ialah :

PALAPA A-1 : 83° Bujur Timur.
PALAPA A-2 : 77° Bujur Timur.
PALAPA B-1 : 108° Bujur Timur.
PALAPA B-2 : 113° Bujur Timur.

Umur Satelit PALAPA yang efektif rata-rata ialah 7 tahun, sehingga setiap 7 tahun harus diluncurkan Satelit PALAPA baru dengan lokasi yang berbeda dengan Satelit PALAPA terdahulu.

Karena sifat jangkauan pancarannya yang sangat luas dan dapat mengatasi halangan bukit-bukit maupun bangunan-bangunan tinggi, maka bagi negara-negara yang mempunyai daerah luas bergunung-gunung atau merupakan kepulauan seperti halnya Indonesia, penggunaan Satelit sebagai penyalur isyarat TV pada saat ini merupakan hal yang mutlak diperlukan.

Malaysia, Thailand dan Filipina juga memanfaatkan fasilitas Satelit PALAPA untuk keperluan penyaluran isyarat TV bagi daerah-daerah yang tidak terjangkau oleh Stasiun-stasiun penghubung maupun stasiun-stasiun pengulang di darat. Bahkan Thailand baru-baru ini telah memastikan akan membeli ex Satelit PALAPA B-2 yang gagal untuk mengitari bumi dalam posisi geostationer (putaran yang sinkron dengan putaran bumi) tetapi berhasil diambil kembali oleh NASA, untuk keperluan penyaluran isyarat TV maupun isyarat-isyarat komunikasi lainnya yang makin meningkat keperluannya.

Negara-negara lain yang yang telah memanfaatkan fasilitas Satelit komunikasi untuk menyalurkan isyarat TV antara lain : Canada, Amerika Serikat, Uni Sovyet, India, Jepang dan Australia.

II. Transmitting T.V. signals via satellite.

As mentioned above T.V. signals can only be transmitted as far as the line of sight. Indonesia consist of a great number of island.
The distance between one island to another is beyond the line of sight.

The archipelago therefore covers a vast area. The region surpasses Jakarta's T.V. transmission range, though supported with a link and repeater station network.

The communication satellite which is currently in fucntion, has extended the transmission range over of T.V. broadcast over a larger area, which theoritically includes half the globe.

(See on picture : 2).

But economic, and different political views among the nations demanded that the use of communication satellite, its transmission frequency and transmission power is to be regulated by an Power International Body known as The International Telecommunication Union (I T U) which is based in Geneva (Switzerland).

By launching a Domestic Palapa Satellite, Indonesia has benefited from T.V. signal transmission via satellite whose transmission radius covers a vast area.

Palapa satellite transmission radius covers Indonesia, Singapore, Malaysia, Thailand, Vietnam, The Philippines, and part of Papua New Guinea. T.V. owners in those regions can benefit from TVRI'S broadcast by attaching a TVRO (Television Receiver Only) unit to their T.V. set.
TVRO units are manufactured by the National Electronic Institute - National Institute Of Science and by the Radio Frequency Communication (R F C) in Bandung.

The International Telecommunication Union has regulated the position of the Palapa Satellite at :

Palapa A–1 : 83° East longitude.
Palapa A–2 : 77° East longitude.
Palapa B–1 : 108° East longitude.
Palapa B–2 : 113° East longitude.

The Palapa satellite effective life a span is to last for 7 years and should be renewed another satellite orbiting at a different position.

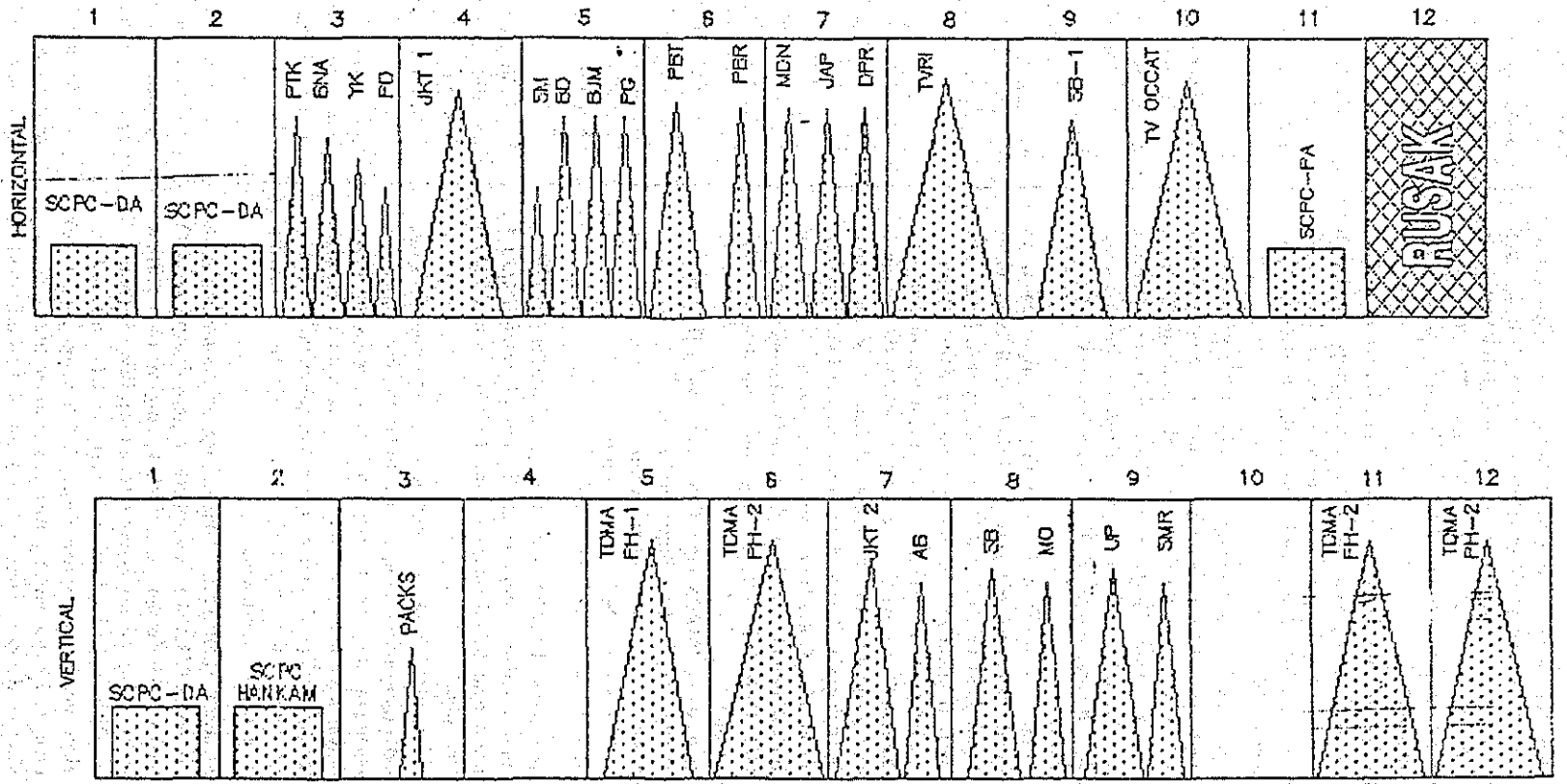
As the satellite transmission power can cover a wide area and its signal transmission system is not obstructed by montains or high-time buildings, the satellite use for Indonesia known for its mountainous landscape would be very advantagous.

Malaysia, Thailand and The Philippines also benefited from the Palapa satellite for the transmission of T.V. signals to remote regions which cannot be reached by link stations nor terrestrial repeater stations.

Thailand has decided to buy the Palapa B – 2 satellite which failed to orbit in its geostationary position. It was later retrieved by NASA and will be utilized for the transmission of TV and other communication signals which for their functions are in high demand.

Other countries that have also launched a communication satellite for the transmission of T.V. signals are Canada, the United States, the Soviet Union, India, Japan and Australia.

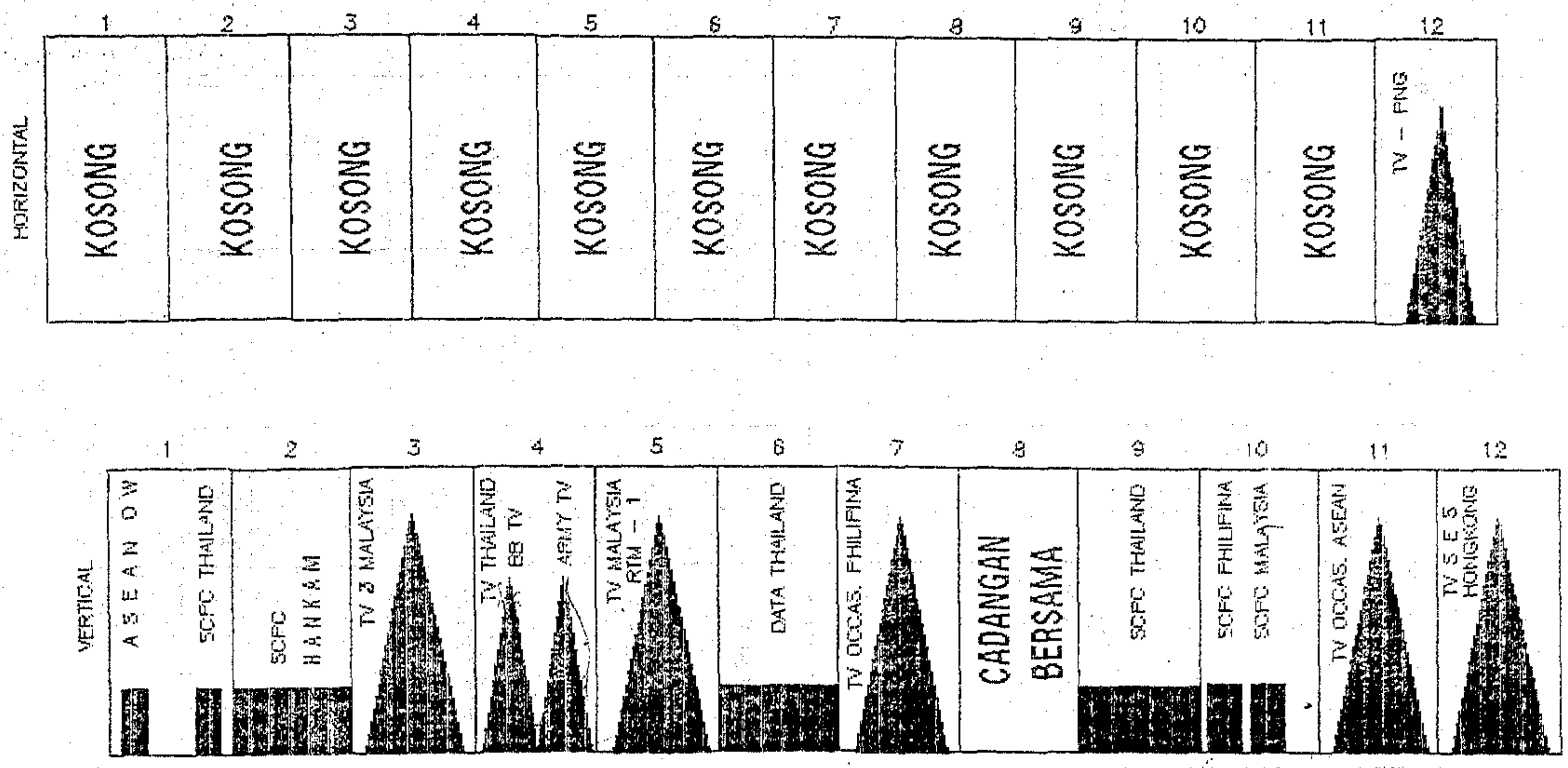
PEMAKAIAN TRANSPONDER PALAPA-B 1
SETELAH PGRM FDMFM 1212 DAN TDMA PH-2



A L O K A S I

TRANSPONDER PALAPA - B2P

POSISI : S/D AKHIR TAHUN 1990



Launching Schedule of PALAPA Satellite

Planning Period		PELITA IV	REPELITA V	REPELITA VI	REPELITA VII
YEAR		1989	1994	1999	
PALAPA	A2	(12) ------			
	B1	(24) 1991			
	B2P	1987 (24)	1995		
	C1		1991 (24)	2001	
	C2		1995	(24)	
	D1			2001	(36)
	D2				
		( ): No. of Transponders			
Frequency	C band	48	48	48	48
	Ku band	-	-	-	12
Use of Transponder	FDM	7	7	-	-
	SCPC	5	5	6	6
	TDMA	4	6	13	17
	TV	1	1	2	2
	SPARE	1	1	1	1
	OTHERS	6	4	2	10
	LEASE	24	24	24	24

SECTION 2

PERFORMANCE CHARACTERISTICS OF SOUND-PROGRAMME CIRCUITS

Recommendation J.21

PERFORMANCE CHARACTERISTICS OF 15-kHz TYPE SOUND-PROGRAMME CIRCUITS [1]

(Geneva, 1972; amended at Geneva, 1976 and 1980)

Circuits for high-quality monophonic and stereophonic transmissions

The CCITT

unanimously recommends

that, taking account of the definition in § 1 below, high-quality monophonic and stereophonic sound-programme transmissions should satisfy the requirements laid down in §§ 2 and 3 below.

1 Definition

When the hypothetical reference circuit defined in Recommendation J.11 is composed of three "sound-programme carrier sections" the requirements indicated below should be met.

2 Requirements at audio interconnection points

2.1 *Measurement of characteristics*

When making measurements of the characteristics of a circuit, these should be made with the output terminated with a 600-ohm non-reactive load.

2.2 *Impedance and matching conditions*

The audio-frequency input impedance should be 600 ohms balanced; the tolerance on this value is a matter for further study.

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[1] This Recommendation corresponds to CCIR Recommendation 505-1 [1].

It is provisionally recommended that the output impedance be balanced with respect to earth and be so low that the output level in the nominal transmission range does not decrease by more than 0.3 dB if the open-circuit output is loaded with 600 ohms. This output impedance is intended for connection to a nominal load impedance of 600 ohms.

This clause alone would not, however, rule out a large difference in the reactive parts of the output impedances of a stereophonic pair, and this in turn could lead to difficulties in meeting the limits of § 3.2.2 below. This aspect needs further study.

For amplifiers which are intended for direct connection to audio frequency sound-programme lines, the reactive part of the output impedance should be restricted. A maximum value of 100 ohms for the series reactance part of the output impedance at frequencies in the transmitted range is provisionally recommended.

2.3 *Relative level*

The relative level on a sound-programme circuit at the audio-frequency amplifier output should be fixed at +6 dBrs [2].

3 Performance of the hypothetical reference circuit for 15 kHz-type sound-programme circuits

The values given correspond to circuits operating with analogue techniques and are expected to be met on such transmission systems. Special additional parameters concerning digital techniques are under study (see § 4 below).

3.1 *Parameters for monophonic sound-programme transmission*

3.1.1 Nominal bandwidth: 0.04 to 15 kHz.

3.1.2 Insertion gain at 0.8 or 1 kHz: this parameter should be measured at a sending level equivalent to −12 dBm0 as specified by the CCITT for setting up sound-programme circuits.

3.1.2.1 Adjustment error: not to fall outside the range ± 0.5 dB.

3.1.2.2 Variation during 24 hours: not to exceed ± 0.5 dB.

If the broadcasting organizations wish to have closer tolerances, it is necessary for the receiving broadcasting organizations to insert additional timing attenuators.

3.1.3 The gain/frequency response referred to 0.8 or 1 kHz should comply with the following limits:

0.04 to 0.125 kHz: +0.5 to −2.0 dB
0.125 to 10 kHz: +0.5 to −0.5 dB
10 to 14 kHz: +0.5 to −2.0 dB
14 to 15 kHz: +0.5 to −3.0 dB

For the combined effect of three modulator and demodulator equipments, a tolerance of ± 0.5 dB from 0.125 to 10 kHz is considered the closest that can be met by equipments in practice. If broadcasting organizations wish to have closer tolerances, it is necessary for the receiving broadcasting organization to insert additional equalizers.

This response should be measured using a test level of −12 dBm0.

3.1.4 The difference between group delay at the given frequency and the minimum value of group delay should not exceed the following limits:

0.04 kHz: 55 ms
0.075 kHz: 24 ms
14 kHz: 8 ms
15 kHz: 12 ms

[2] See the definition of zero-relative level in Recommendation J.14.

3.1.5 *Maximum weighted noise level*

−42 dBq0ps.

This parameter is defined in terms of a weighting network and a quasi-peak measuring instrument in accordance with CCIR Recommendation 468-2, which is reproduced at the end of Recommendation J.16.

Note 1 – If an r.m.s. measuring instrument is used the measured value will be about 5 dB less than for the quasi-peak measurement.

Note 2 – If the weighting network defined in the Recommendation cited in [2] is used, the measured value will be about 4 dB less. More details are given in [3].

Note 3 – Suitable values for unweighted noise cannot be recommended with precision because such values depend upon characteristics of the circuit noise. However, if an unweighted noise measurement is performed upon a sound-programme circuit just complying with the requirements of §§ 3.1.5 and 3.1.6 then the worst values expected to be found are −41 dBm0s and/or −36 dBq0s, and in most cases the values obtained will be several decibels better.

CCIR Report 493-2 [4] indicates that if a compandor is used, then with some programme material an improved signal-to-noise ratio is necessary to avoid objectionable effects.

When using radio-relay systems, the values given for both the weighted and unweighted noise should not be exceeded for more than 20% of any month. For 1% and 0.1% of any month, limits 4 dB higher and 12 dB, respectively, seem to be acceptable.

3.1.6 The single-tone interference, measured selectively, should not exceed (−73 − Δps) dBm0s, in which Δps is the correction for the frequency being measured, given by the weighting characteristics in CCIR Recommendation 468-2 (which is reproduced at the end of Recommendation J.16).

For sound-programme transmissions over carrier systems, occurrence of carrier leaks can be expected. For this reason, stop filters may be provided in the carrier frequency path which can be switched in, if required, to suppress the tones otherwise audible in the upper frequency range from 8 to 15 kHz. For a hypothetical reference circuit, a 3-dB bandwidth of less then 3% for stop filters, referred to the mid-frequency, is recommended. The use of stop filters influencing frequencies below 8 kHz should be avoided.

3.1.7 *Disturbing modulation by power supply*

The highest-level unwanted side-component due to modulation of a sound-programme signal caused by interference from conventional a.c. line power supply sources, should not be greater than −45 dB, relative to the level of a sine-wave measuring signal applied to the sound-programme circuit (in accordance with CCIR Recommendation 474 [5]). The value for higher frequencies has to be determined (see CCIR Study Programme 17F/CMTT [6]).

3.1.8 *Nonlinear distortion*

There are certain difficulties in giving a general recommendation on nonlinearity, due to restrictions imposed by the CCITT on the levels and durations of test tones (see especially Recommendations N.21 [7] and N.23 [8]). Pending progress with other test methods, the following tests are recommended.

3.1.8.1 Harmonic distortion factors measured with single-tone test signals at +9 dBm0s should not exceed the limits given in Table 1/J.21.

TABLE 1/J.21

Frequency of test-tone (kHz)	Total harmonic distortion (%)	Second harmonic and third harmonic measured selectively (%)
0.04 to 0.125	1	0.7
0.125 to 7.5	0.5	0.35

The duration for which a single tone is to be transmitted at this level should be restricted in accordance with the appropriate Series N Recommendations.

3.1.8.2 The difference-tone factors [3] selectively measured with double-tone send signals each at +3 dBm0 should not exceed the following limits:

3.1.8.2.1 Frequencies 0.8 and 1.42 kHz corresponding to those prescribed in Recommendation O.31 [9], for a 3rd-order difference-tone measured at 0.18 kHz: 0.5%

3.1.8.2.2 Frequencies 5.6 and 7.2 kHz for a 2nd-order difference-tone measured at 1.6 kHz: 0.5%

3.1.8.2.3 Frequencies 4.2 and 6.8 kHz for a 3rd-order difference-tone measured at 1.6 kHz: 0.5%

The measurements of §§ 3.1.8.2.2 and 3.1.8.2.3 are intended for baseband transmissions on physical circuits only and on modulation equipment in the local loops.

3.1.9 *Error in reconstituted frequency*

Not to be greater than 1 Hz.

Note – A maximum error of 1 Hz is in principle acceptable where there is only a single transmission path between the signal source and the listener.

When the broadcast network is composed of two or more parallel paths, e.g. commentary and separate sound channels, or radio broadcasts from different transmitters on the same frequency, unacceptable beats may occur unless zero error can be assured. The CCITT is studying methods of effecting this in all recommended systems.

3.1.10 *Intelligible crosstalk ratio*

3.1.10.1 The intelligible crosstalk ratio from other sound-programme circuits or from a telephone circuit into a sound-programme circuit should be measured selectively in the disturbed circuit at the same frequencies as those of the sinusoidal test signal applied to the disturbing circuit, and should not be less than the following values:

0.04 kHz:	50 dB
0.04 to 0.5 kHz:	oblique straight-line segment on linear-decibel and logarithmic-frequency scales
0.5 to 5 kHz:	74 dB
5 to 15 kHz:	oblique straight-line segment on linear-decibel and logarithmic-frequency scales
15 kHz:	60 dB.

3.1.10.2 The near- or far-end crosstalk ratio between a sound-programme circuit (disturbing circuit) and a telephone circuit (disturbed circuit) should be at least 65 dB.

Notes to § 3.1.10

Note 1 – It is understood that these values are defined between the relative levels applicable to telephony. An explanation for the relation between the relative levels for sound-programme circuits and telephone circuits is given in the Annex to Recommendation J.22.

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[3] Attention is drawn to the fact that in transmission systems using compandors, a 3rd-order difference-tone may occur which exceeds the specified limit of 0.5%. This may occur when the difference between the two fundamental frequencies is less than 200 Hz. Thus, the components due to 3rd-order distortion will have frequencies which correspond to the difference between the two test frequencies. However, in these cases the subjective masking is such that a distortion up to 2% is acceptable.

Note 2 – The CCITT draws the attention of Administrations to the fact that it is in some cases difficult or impossible to meet these limits. This may occur when unscreened pairs are used for a long audio-frequency circuit (e.g. about 1000 km or longer), or in certain carrier systems on symmetric pair cables, or in the low frequency range (e.g. below about 100 kHz) in certain carrier systems on coaxial cables. When such difficulties arise, such systems or parts of systems should be avoided, if possible, for setting up programme channels.

Note 3 – When a minimum noise level of at least 4000 pW0p is always present in the telephone channel (this may be the case in satellite systems, for example) a reduced crosstalk ratio of 58 dB between a sound-programme circuit and a telephone circuit is acceptable.

Note 4 – The CCITT draws the attention of Administrations to the fact that, because of crosstalk which may occur in terminal modulating and line equipment, special precautions may have to be taken to meet the above crosstalk limits between two sound-programme circuits, simultaneously occupying the go and return channels respectively of a carrier system (the most economical arrangement), because in those circumstances they occupy the same position in the line-frequency band (see Recommendation J.18).

Note 5 – The value indicated is based on the assumption that sine-wave test signals are used. The use of the test signal as described in Recommendation J.19 is under study.

Note 6 – The effect of crosstalk from a sound-programme circuit into a telephone circuit is not a question of secrecy, but rather of subjective disturbance by an interfering signal whose character is noticeably different from random noise or babble.

The frequency offset adopted for some sound-programme equipment allows a reduction of crosstalk from a telephone circuit into a sound-programme circuit. However in the reverse direction, this reduction of crosstalk remains only for speech material, but is practically ineffective for music material.

3.1.11 *Error in amplitude/amplitude response*

When the level of a 0.8 or 1-kHz test signal is changed from +6 to −6 dBm0s or vice versa, the level difference at the receiving end should not lie outside the range 12 ± 0.5 dB. This level change of the test signal corresponds to that prescribed in Recommendation O.31 [9].

3.2 *Additional parameters for stereophonic programme transmission*

3.2.1 The difference in gain between A and B channels should not exceed the following values:

0.04 to 0.125 kHz: 1.5 dB
0.125 to 10 kHz: 0.8 dB
10 to 14 kHz: 1.5 dB
14 to 15 kHz: 3 dB

3.2.2 The phase difference between the A and B channels should not exceed the following values:

0.04 kHz:	30°
0.04 to 0.2 kHz:	oblique straight-line segment on linear-degree and logarithmic-frequency scales
0.2 to 4 kHz:	15°
4 to 14 kHz:	oblique straight-line segment on linear-degree and logarithmic-frequency scales
14 kHz:	30°
15 kHz:	40°

3.2.3 The crosstalk ratio between the A and B channels should not be less than the following limits:

3.2.3.1 Intelligible crosstalk ratio, measured with sinusoidal test signal from 0.04 to 15 kHz: 50 dB.

3.2.3.2 Nonlinear crosstalk ratio [4] from 0.04 to 15 kHz: 60 dB.

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[4] The CMTT is requested to produce a definition for this expression.

4 Transmission performance of the hypothetical reference circuit for 15 kHz-type sound-programme circuits with particular reference to digital methods of transmission

This section will deal with special additional parameters for digital systems. CCIR Report 649 [10] and Study Programme 14A/CMTT [11] refer.

Note – The CCIR has issued Recommendation 572 [12] which deals with the transmission of one sound-programme associated with an analogue television signal by means of time-division multiplex in the line synchronizing pulse. The system recommended is a digital one, using pulse code modulation. A sound-programme bandwidth of 14 kHz is provided.

5 Estimation of transmission performance of circuits shorter or longer than the hypothetical reference circuit

CCIR Study Programme 17D/CMTT [13] refers.

Note – For further work, CCIR Report 496-2 [14] may be consulted. This Report also draws attention to certain differences between the above Recommendation and one drawn up by the OIRT.

References

[1] CCIR Recommendation *Characteristics of 15 kHz-type sound-programme circuits*, Vol. XII, Rec. ~~505-1~~ 505-2, ITU, Geneva, 1978.

[2] CCITT Recommendation *Psophometers (apparatus for the objective measurement of circuit noise)*, Green Book, Vol. V, Rec. P.53, Part B, ITU, Geneva, 1973.

[3] CCIR Report *Circuits for high-quality monophonic and stereophonic transmissions*, Vol. XII, Report ~~496-2~~ 496-3, Table II, ITU, Geneva, 1978.

[4] CCIR Report *Compandors for sound-programme circuits*, Vol. XII, Report 493-2, ITU, Geneva, 1978.

[5] CCIR Recommendation *Modulation of signals carried by sound-programme circuits by interfering signals from power supply sources*, Vol. XII, Rec. 474, ITU, Geneva, 1978.

[6] CCIR Study Programme 17F/CMTT *Noise in sound-programme circuits from the power supply*, Vol. XII, ITU, Geneva, 1978.

[7] CCITT Recommendation *Limits and procedures for the lining-up of a sound-programme circuit*, Vol. IV, Fascicle IV.3, Rec. N.21.

[8] CCITT Recommendation *Routine maintenance measurements to be made on international sound-programme circuits*, Vol. IV, Fascicle IV.3, Rec. N.23.

[9] CCITT Recommendation *Specification for an automatic measuring equipment for sound-programme circuits*, Vol. IV, Fascicle IV.4, Rec. O.31.

[10] CCIR Report *Transmission performance of the hypothetical reference circuit for high quality sound-programme circuits with particular reference to digital methods of transmission*, Vol. XII, Report 649, ITU, Geneva, 1978.

[11] CCIR Study Programme 14A/CMTT *Digital transmission of television signals*, Vol. XII, ITU, Geneva, 1978.

[12] CCIR Recommendation *Transmission of one sound-programme associated with an analogue television signal by means of time-division multiplex in the line synchronizing pulse*, Vol. XII, Rec. 572, ITU, Geneva, 1978.

[13] CCIR Study Programme 17D/CMTT *Estimation of transmission performance of sound-programme circuits shorter or longer than the hypothetical reference circuit*, Vol. XII, ITU, Geneva, 1978.

[14] CCIR Report *Circuits for high-quality monophonic and stereophonic transmissions*, Vol. XII, Report 496-2, ITU, Geneva, 1978.

Recommendation J.22

PERFORMANCE CHARACTERISTICS OF 10-kHz TYPE SOUND-PROGRAMME CIRCUITS [1]

(former Recommendation J.21; amended at Geneva, 1972, 1976 and 1980)

The CCITT

unanimously recommends

that, when the hypothetical reference circuit defined in Recommendation J.11 is assumed to be made of three 10-kHz type sound-programme circuit sections, the characteristics given below apply with the following reservations:

1) For an audio-frequency circuit, all the characteristics are valid, except for intelligible crosstalk.

2) For a circuit on a carrier system, all the characteristics are valid, except for intelligible crosstalk and noise. (See Annex A.)

1 Requirements at audio-frequency interconnection points

1.1 *Measurement of characteristics*

When measuring the characteristics of a circuit, the output should be terminated with a 600-ohm nonreactive load.

1.2 *Impedance and matching conditions*

The audio input impedance should be 600 ohms balanced; the tolerance on this value is a matter for further study.

It is provisionally recommended that the output impedance be balanced with respect to earth and be so low that the output level in the nominal transmission bandwidth does not decrease by more than 0.3 dB if the open-circuit output is loaded with 600 ohms. This output impedance is intended for connection to a nominal load impedance of 600 ohms.

For amplifiers which are intended for direct connection to sound-programme lines, the reactive part of the output impedance should be restricted. A maximum value of 100 ohms for the series reactance part of the output impedance at frequencies in the transmitted bandwidth is provisionally recommended.

1.3 *Relative level*

The relative level of a sound-programme circuit at the audio-frequency amplifier output should be fixed at +6 dBrs (see Recommendation J.14).

2 Nominal bandwidth

The nominal bandwidth is 0.05 to 10 kHz.

3 Attenuation distortion

Figure 1/J.22 shows the permissible limits for the variation of the received level with frequency (relative to the value measured at 800 Hz). The method of measuring this level variation with frequency is shown in Recommendation N.21 [2].

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[1] This Recommendation corresponds to CCIR Recommendation 504-1 [1].

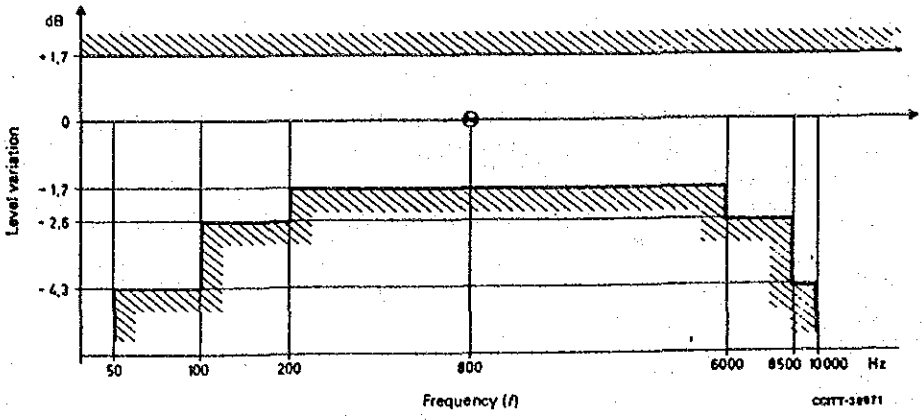

FIGURE I/J.22

Variation of the received level with frequency relative to the value at 800 Hz

When the circuit is set up on a carrier system, the curve applies to the combined three pairs of equipments for modulation from, and demodulation to, audio frequencies, as included in the hypothetical reference circuit for programme transmision.

4 Group-delay distortion

The difference between the group delay t_f, for the frequency f considered, and the minimum group delay t_{min}, should not exceed the following values:

8 ms for $t_{10\,000} - t_{min}$
20 ms for $t_{100} - t_{min}$
80 ms for $t_{50} - t_{min}$

5 Maximum weighted noise level [2)]

−39 dBq0ps

This parameter is defined in terms of a weighting network and a quasi-peak measuring instrument in accordance with CCIR Recommendation 468-2 (which is reproduced at the end of Recommendation J.16).

Note 1 – If an r.m.s. measuring instrument is used the measured value will be about 5 dB less than for the quasi-peak measurement.

Note 2 – If the weighting network defined in the Recommendation cited in [3] is used the measured value will be about 4 dB less. More details are given in Table II of CCIR Report 496-2 [4].

Note 3 – Suitable values for unweighted noise cannot be recommended with precision because such values depend upon characteristics of the circuit noise. However, if an unweighted noise measurement is performed upon a sound-programme circuit just complying with the requirements of § 5, then the worst value expected to be found is −28 dBm0s and/or −23 dBq0s, and in most cases the values obtained will be several decibels better.

6 Intelligible crosstalk ratio

6.1 The near- or far-end crosstalk ratio (for speech) between two sound-programme circuits or between a telephone circuit (disturbing circuit) and a sound-programme circuit (disturbed circuit) should be at least 74 dB.

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2) For circuits on carrier systems, it is not always possible in the absence of special precautions to meet the limits recommended in § 5 (see Annex A).

6.2 The near- or far-end crosstalk ratio between a sound-programme circuit (disturbing circuit) and a telephone circuit (disturbed circuit) should be at least 65 dB.

Notes to § 6

Note 1 – It is understood that these values are defined between the relative levels applicable to telephony. An explanation of the relation between the relative levels for sound-programme ciruits and telephone circuits is given in Annex A.

Note 2 – The CCITT draws the attention of Administrations to the fact that it is in some cases difficult or impossible to meet these limits. This may occur when unscreened pairs are used for a long audio-frequency circuit (e.g. about 1000 km or longer), or in certain carrier systems on symmetric pair cables, or in the low frequency range (e.g. below about 100 kHz) in certain carrier systems on coaxial cables. When such difficulties arise, such systems or parts of systems should be avoided, if possible, for setting up programme channels.

Note 3 – Where a minimum noise level of at least 4000 pW0p is always present in the telephone channel (this may be the case in satellite systems, for example) a reduced crosstalk ratio of 58 dB between a sound-programme circuit and a telephone circuit is acceptable.

Note 4 – The CCITT draws the attention of Administrations to the fact that, because of crosstalk which may occur in terminal modulating and line equipment, special precautions may have to be taken to meet the above crosstalk limits between two sound-programme circuits, simultaneously occupying the go and return channels respectively of a carrier system (the most economical arrangement), because in those circumstances they occupy the same position in the line-frequency band (see Recommendation J.18).

Note 5 – The value indicated is based on the assumption that sine-wave test signals are used. The use of the test signal as described in Recommendation J.19 is under study.

Note 6 – The effect of crosstalk from a sound-programme circuit into a telephone circuit is not a question of secrecy, but rather of subjective disturbance by an interfering signal whose character is noticeably different from random noise or babble.

The frequency offset adopted for some sound-programme equipment allows a reduction of crosstalk from a telephone circuit into a sound-programme circuit. However, in the reverse direction, this reduction of crosstalk remains only for speech material, but is practically ineffective for music material.

7 Change of relative level with time

The 800-Hz relative level at the far end of the circuit should meet the defined conditions for attenuation distortion, and also during a given programme transmission should not change from its nominal value by more than ± 2 dB. Also, for sound-programme circuits on special pairs or on the phantom circuits of unloaded symmetric pairs, the 800-Hz relative level at the output of a frontier amplifier should not change from its nominal value by more than ± 1 dB during a given programme transmission.

8 Nonlinear distortion

The total harmonic distortion coefficient for the 2500-km hypothetical reference circuit for programme transmissions should not exceed 4% (harmonic distortion attenuation of 28 dB) at any frequency within the band to be transmitted, the measurement being made with a sinusoidal signal (fundamental frequency) of +9 dBm0 connected to the origin of the circuit. The total harmonic distortion coefficient, k, is calculated from the formula.

$$k = \sqrt{k_2^2 + k_3^2}$$

where

k_2 is the 2nd order harmonic distortion coefficient and
k_3 is the 3rd order harmonic distortion coefficient.

However, the following values should be considered as desirable design objectives for future developments:

3% (30 dB), at fundamental frequencies below 100 Hz,
2% (34 dB), at fundamental frequencies above 100 Hz.

Note – Precautions should be taken in the measurement of harmonic distortion on circuits equipped with pre-emphasis networks. (See Recommendation N.21 [2].

9 Interference from the power supply

The most intense unwanted side component due to modulation of a sound-programme signal caused by interfering signals from power supply sources should not be of greater than –45 dB relative to the level of a sine-wave test signal applied to the sound-programme circuit.

10 Error in reconstituted frequency

The difference between the initial and reconstituted frequencies should not exceed 2 Hz.

Note – When the broadcast network is composed of two or more parallel paths, e.g. commentary and separate sound channels, or radio broadcast from different transmitters on the same frequency, unacceptable beats may occur unless zero error can be assured. The CCITT is studying methods of effecting this in all recommended systems.

11 Single-tone interference

Under study. (The subjective assessment of single-tone interference on high-quality circuits will be carried out by a method described in CCIR Report 623 [5].)

ANNEX A

(to Recommendation J.22)

Values of noise expected in practice on 2500 km circuits

A.1 *Estimated noise power levels*

Table A-1/J.22 shows the noise values arising when sound-programme circuits (using pre-emphasis and de-emphasis in accordance with Recommendation J.17) are set up in place of three telephone channels, each of which conforms to the general noise objectives given in Recommendation G.222 [6]. The assumptions made for the purpose of the noise calculations are shown at the end of this Annex.

TABLE A-1/J.22

	One-minute mean value	
	for not more than 20% of a month	for not more than 0.1% of a month
Noise power level weighted with the network of the Recommendation cited in [3]	—44.5 dBm0ps	—37.5 dBm0ps

Note – The increased noise level shown as occurring for not more than 0.1% of a month applies when the carrier circuit is established over a radio-relay system.

A.2 *Performance of 10-kHz sound-programme circuits*

When 10 kHz and 6.4 kHz-type sound-programme circuits which include emphasis and de-emphasis networks, are set up on a carrier system it is recommended that, for reasons of overload, the relative level at 800 Hz on such a circuit at a zero-relative level point (deduced from the level diagram of telephone circuits set up on the same 12-circuit group) should lie between a maximum of −1.5 dB and a minimum of −4.5 dB.

The level of −1.5 dB could be considered as normal. A further 3-dB adjustment to permit a decrease down to −4.5 dB should, however, be included to cover the case of exceptional overloading if operational experience shows that in fact this is necessary.

Note – Certain problems connected with the use of pre-emphasis on carrier systems have not yet been satisfactorily resolved. These are:

- the limitation of the level of testing tones, which is of concern to Study Group IV;
- the effect of pre-emphasis on the harmonic distortion requirements which the programme circuit should meet at high frequencies [3].

A.3 *Use of compandors*

Provided the compressor and the expander are of the same make, it is possible to obtain overall transmission characteristics as regards noise which conform to the CCITT Recommendations for the 2500-km hypothetical reference circuit, without introducing other factors that might impair transmission performance. The CCITT is now examining recommendations on the compressor and the expander, considered separately, so as to achieve the same result.

A.4 *Assumptions and conventional terms*

The expression dBm0ps is used to indicate noise power levels in a sound-programme circuit which have been psophometrically weighted according to the Recommendation cited in [3], and measured in decibels relative to 1 mW at a point of zero relative sound-programme level (0 dBrs), in that circuit. The CCITT practice in the past has been to quote noise level for sound-programme circuits relative to "peak programme" or "maximum voltage" which is defined as a voltage of 2.2 volts r.m.s. (measured at the terminals of an impedance of 600 ohms) at a point of zero relative sound-programme level. The signal-to-noise ratio objective of 57 dB (previously given in the Recommendation cited in [7] is thus equivalent to a noise power level of −48 dBm0ps.

The value for not more than 20% of a month was calculated for 10-kHz type circuits on the following assumptions:

– noise on one telephone channel (including the multiplex equipment) according to Recommendation G.222 [6], weighted for telephony	−50 dBm0ps
– Bandwidth correction from 3.1 to 10 kHz	+ 5 dB
– Suppression of weighting for telephony (in the case of a uniform-spectrum noise)	+ 2.5 dB
– Improvement due to pre-emphasis [4] (see Recommendation J.17)	− 9 dB
– Effect of the relative level shifted by −1.5 dB at 800 Hz	+ 1.5 dB
– Weighting for sound-programme transmissions according to the Recommendation cited in [3]	+ 5.5 dB
Total	−44.5 dBm0ps

The value for not more than 0.1% of a month was calculated on the basis of the noise variations to be expected on a radio-relay link used mainly for providing telephone circuits and conforming with Recommendation G.222 [6].

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[3] Measurements of harmonic distortion on programme circuits having pre-emphasis must be treated with reserve. This point is being studied by the CCITT.

[4] Set to have zero loss at 800 Hz.

References

[1] CCIR Recommendation *Performance characteristics of 10 kHz type sound-programme circuits*, Vol. XII, Rec. 504-1, ITU, Geneva, 1978.

[2] CCITT Recommendation *Limits and procedures for the lining-up of a sound-programme circuit*, Vol. IV, Fascicle IV.3, Rec. N.21.

[3] CCITT Recommendation *Psophometers (apparatus for the objective measurement of circuit noise)*, Green Book, Vol. V, Rec. P.53, Part B, ITU, Geneva, 1973.

[4] CCIR Report *Circuits for high-quality monophonic and stereophonic transmissions*, Vol. XII, Report 496-2, ITU, Geneva, 1978.

[5] CCIR Report *Method proposed for the subjective assessment of the quality of sound in broadcasting and of the performance of sound-programme systems*, Vol. XII, Report 623, ITU, Geneva, 1978.

[6] CCITT Recommendation *Noise objectives for design of carrier-transmission systems of 2500 km*, Vol. III, Fascicle III.2, Rec. G.222.

[7] CCITT Recommendation *10-kHz type sound-programme circuits*, Green Book, Vol. III, Rec. J.22, § e), ITU, Geneva 1973.

Recommendation J.23 [1), 2)]

PERFORMANCE CHARACTERISTICS OF NARROW-BANDWIDTH SOUND-PROGRAMME CIRCUITS

(amended at Geneva, 1980)

Circuits of medium quality for monophonic transmission

The CCITT

unanimously recommends

that, taking into account the definitions in § 1, narrow-bandwidth sound-programme circuits should satisfy the requirements for monophonic transmission laid down in §§ 2 and 3.

1 Definitions

In this Recommendation the narrow-bandwidth sound-programme circuits include:

7 kHz type circuits,
6.4 kHz type circuits,
5 kHz type circuits. [3)]

The requirements in § 3 should be met by the hypothetical reference circuit as defined in CCIR Recommendation 502-1 [3].

2 Requirements at audio interconnection points

2.1 *Measurement of characteristics*

When measuring the characteristics of a circuit, the output should be terminated with a 600 ohm nonreactive load.

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1) This Recommendation corresponds to CCIR Recommendation 503-1 [1].

2) CCIR Report 641 [2] was considered in renewing this Recommendation.

3) Sound-programme circuits of the 5-kHz type are widely used in North America.

2.2 *Impedance and matching conditions*

The audio-frequency input impedance should be 600 ohms balanced; the tolerance on this value is a matter for further study.

It is provisionally recommended that the output impedance be balanced with respect to earth and be so low that the output level in the nominal transmission range does not decrease by more than 0.3 dB if the open-circuit output is loaded with 600 ohms. This output impedance is intended for connection to a nominal load impedance of 600 ohms.

For amplifiers which are intended for direct connection to audio programme lines, the reactive part of the output impedance should be restricted. A maximum value of 100 ohms for the series reactance part of the output impedance at frequencies in the transmitted range is provisionally recommended.

2.3 *Relative level*

The relative level on a sound-programme circuit at the audio-frequency amplifier output should be fixed at +6 dBrs. [4)]

3 Performance of the hypothetical reference circuit

The values given should be met by circuits operating with analogue techniques. However, the international circuits which have equipments designed before the adoption of this Recommendation may have parameters different from those given here in § 3.

Special additional parameters concerning digital transmission are under study.

3.1 *Nominal bandwidth*

7 kHz type circuits: 0.05 to 7 kHz
6.4 kHz type circuits: 0.05 to 6.4 kHz
5 kHz type circuits: 0.07 to 5 kHz

3.2 *Insertion gain at 0.8 or 1 kHz*

This parameter is defined at a sending level of −12 dBm0 in accordance with Recommendation N.21 [4].

a) *Adjustment error*

Less than ± 0.5 dB

b) *Daily variation*

Less than ± 0.5 dB

3.3 *Gain/frequency response referred to 0.8 or 1 kHz*

This parameter is defined at a sending level of −12 dBm0 in accordance with Recommendation N.21 [4].

a) *7 kHz type circuits*

0.05 to 0.1 kHz: +1 to −3 dB
0.1 to 6.4 kHz: +1 to −1 dB
6.4 to 7 kHz: +1 to −3 dB

b) *6.4 kHz type circuits*

0.05 to 0.1 kHz: +1 to −3 dB
0.1 to 5 kHz: +1 to −1 dB
5 to 6.4 kHz: +1 to −3 dB

c) *5 kHz type circuits*

0.07 to 0.2 kHz: +1 to −3 dB
0.2 to 4 kHz: +1 to −1 dB
4 to 5 kHz: +1 to −3 dB

---

4) See the definition of zero-relative level in Recommendation J.14.

3.4 *Difference of group delay between the minimum value and the values at given frequencies*

a) *7 kHz type circuits*

0.05 kHz: < 80 ms
0.1 kHz: < 20 ms
6.4 kHz: < 5 ms
7 kHz: < 10 ms

b) *6.4 kHz type circuits*

0.05 kHz: < 80 ms
0.1 kHz: < 20 ms
5 kHz: < 5 ms
6.4 kHz: < 10 ms

c) *5 kHz type circuits*

0.07 kHz: < 60 ms
5 kHz: < 15 ms

3.5 *Maximum weighted noise level*

This parameter is defined by terms of a weighting network and a quasi-peak measuring instrument in accordance with CCIR Recommendation 468-2 (which is reproduced at the end of Recommendation J.16):

7 kHz type circuits −44 dBq0ps
6.4 kHz type circuits −39 dBq0ps
5 kHz type circuits −32 dBq0ps

Note 1 – If an r.m.s. measuring instrument is used, the measured value will be about 5 dB less than that for the quasi-peak measurement.

Note 2 – If the weighting network defined in the Recommendation cited in [5] is used, the measured value will be about 4 dB less.

Note 3 – Suitable values for unweighted noise cannot be recommended with precision, because such values depend upon the characteristics of the circuit noise. However, if an unweighted noise measurement is performed upon a sound-programme circuit just complying with the requirements for weighted noise and single tone interference, then the worst values expected to be found are −35 dBq0s or −40 dBm0s, and in most cases the values obtained will be several decibels better.

3.6 *Single tone interference*

This parameter (measured selectively) should not exceed (−73 − Δps) dBm0s. Δps is the correction for the frequency being considered which is given by the weighting characteristic in CCIR Recommendation 468-2 (which is reproduced at the end of Recommendation J.16).

3.7 *Disturbing modulation by power supply*

The highest-level unwanted side-component due to modulation of a sound-programme signal caused by interference from conventional a.c. line power supply sources should not be greater than −45 dB relative to the level of a sine-wave measuring signal applied to the sound-programme circuit (in accordance with CCIR Recommendation 474 [6]). The value for higher frequencies has to be determined (see CCIR Report 495-1 [7] and Study Programme 17F/CMTT [8]).

3.8 *Non-linear distortion*

Total harmonic distortion measured with fundamental signals at +9 dBm0:

– below 0.1 kHz: < 2%

– above 0.1 kHz: < 1.4%.

Third order difference tone measured at 0.18 kHz using signals of 0.8 and 1.42 kHz each at +3 dBm0: < 1.4%.

Note – If harmonic distortion is measured selectively the total harmonic distortion coefficient k should be calculated from the formula:

$$k = \sqrt{k_2^2 + k_3^2}$$

where

k_2 is the second order harmonic distortion coefficient and
k_3 is the third order harmonic distortion coefficient.

3.9 *Error in reconstituted frequency*

Less than 1 Hz.

Note – A maximum error of 1 Hz is in principle acceptable where there is only a single transmission path between the signal source and the listener.

When the broadcast network is composed of two or more parallel paths, e.g. commentary and separate sound channels, or radio broadcast from different transmitters on the same frequency, unacceptable beats may occur unless zero error can be assured. The CCITT is studying methods of effecting this in all recommended systems.

3.10 *Intelligible crosstalk ratio*

3.10.1 The near- or far-end crosstalk ratio (for speech) between two sound-programme circuits or between a telephone circuit (disturbing circuit) and a sound-programme circuit (disturbed circuit) should be at least 74 dB for the range 0.5 kHz to 3.2 kHz. For the range below 0.5 kHz and above 3.2 kHz it should be 74 dB reducing in value at a rate of 6 dB per octave.

3.10.2 The near- or far-end crosstalk ratio between a sound-programme circuit (disturbing circuit) and a telephone circuit (disturbed circuit) should be at least 65 dB.

Notes to § 3.10

Note 1 – It is understood that these values are defined between the relative levels applicable to telephony. An explanation of the relation between the relative levels for sound-programme circuits and telephone circuits is given in Annex A to Recommendation J.22.

Note 2 – The CCITT draws the attention of Administrations to the fact that it is in some cases difficult or impossible to meet these limits. This may occur when unscreened pairs are used for a long audio-frequency circuit (e.g. about 1000 km or longer), or in certain carrier systems on symmetric pair cables, or in the low frequency range (e.g. below about 100 kHz) in certain carrier systems on coaxial cables. When such difficulties arise, such systems or parts of systems should be avoided, if possible, for setting up programme channels.

Note 3 – Where a minimum noise level of at least 4000 pW0p is always present in the telephone channel (this may be the case in satellite systems, for example) a reduced crosstalk ratio of 58 dB between a sound-programme circuit and a telephone circuit is acceptable.

Note 4 – The CCITT draws the attention of Administrations to the fact that, because of crosstalk which may occur in terminal modulating and line equipment, special precautions may have to be taken to meet the above crosstalk limits between two sound-programme circuits, simultaneously occupying the go and return channels respectively of a carrier system (the most economical arrangement) because in those circumstances they occupy the same position in the line-frequency band (see Recommendation J.18).

Note 5 – The value indicated is based on the assumption that sine-wave test signals are used. The use of the test signal as described in Recommendation J.19 is under study.

Note 6 – The effect of crosstalk from a sound-programme circuit into a telephone circuit is not a question of secrecy, but rather of subjective disturbance by an interfering signal whose character is noticeably different from random noise or babble.

The frequency offset adopted for some sound-programme equipment allows a reduction of crosstalk from a telephone circuit into a sound-programme circuit. However in the reverse direction, this reduction of crosstalk remains only for speech material, but is practically ineffective for music material.

3.11 *Error in amplitude/amplitude response*

This parameter is defined by a step level signal $-6/+6$ dBm0 at 0.8 or 1 kHz: < 0.5 dB.

4 Estimations of transmission performance of circuits shorter or longer than the hypothetical reference circuit are under study (Study Programme 17D/CMTT [8]).

References

[1] CCIR Recommendation *Performance characteristics of narrow-bandwidth sound-programme circuits*, Vol. XII, Rec. 503-1, ITU, Geneva, 1978.

[2] CCIR Report *Performance characteristics of 5 kHz type sound-programme circuits*, Vol. XII, Report 641, ITU, Geneva, 1974.

[3] CCIR Recommendation *Hypothetical reference circuits for sound-programme transmissions*, Vol. XII, Rec. 502-1, ITU, Geneva, 1978.

[4] CCITT Recommendation *Limits and procedures for the lining-up of a sound-programme circuit*, Vol. IV, Fascicle IV.3, Rec. N.21.

[5] CCITT Recommendation *Psophometers (apparatus for the objective measurement of circuit noise)*, Green Book, Vol. V, Rec. P.53, Part B, ITU, Geneva, 1973.

[6] CCIR Recommendation *Modulation of signals carried by sound-programme circuits by interfering signals from power supply sources*, Vol. XII, Rec. 474, ITU, Geneva, 1978.

[7] CCIR Report *Noise from the power supply*, Vol. XII, Report 495-1, ITU, Geneva, 1974.

[8] CCIR Study Programme 17F/CMTT *Noise in sound-programme circuits from the power supply*, Vol. XII, ITU, Geneva, 1978.

[9] CCIR Study Programme 17D/CMTT *Estimation of transmission performance of sound-programme circuits shorter or longer than the hypothetical reference circuit*, Vol. XII, ITU, Geneva, 1978.

CHAPTER 4.–OBSTACLE RESTRICTION AND REMOVAL

Note 1.–The objectives of the specifications in this Chapter are to define the airspace around aerodromes to be maintained free from obstacles so as to permit the intended aeroplane operations at the aerodromes to be conducted safely and to prevent the aerodromes from becoming unusable by the growth of obstacles around the aerodromes. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace and thereby establishing an obstacle free zone for flight.

Note 2.–See also Annex 10, Volume I, and the Procedures for Air Navigation Services – Aircraft Operations (Doc 8168-OPS/611) for restrictions in the vicinity of ILS and possible additional aeroplane operational requirements.

4.1.–Obstacle limitation surfaces

Outer horizontal surface

Note.–Guidance on the need to provide an outer horizontal surface and its characteristics is contained in the Airport Services Manual, *Part 6.*

Conical surface

4.1.1 *Description.– Conical surface.* A surface sloping upwards and outwards from the periphery of the inner horizontal surface.

4.1.2 *Characteristics.–* The limits of the conical surface shall comprise:

a) a lower edge coincident with the periphery of the inner horizontal surface;

b) an upper edge located at a specified height above the inner horizontal surface.

4.1.3 The slope of the conical surface shall be measured in a vertical plane perpendicular to the periphery of the inner horizontal surface.

Inner horizontal surface

4.1.4 *Description.– Inner horizontal surface.* A surface located in a horizontal plane above an aerodrome and its environs.

4.1.5 *Characteristics.–* The radius or outer limits of the inner horizontal surface shall be measured from a reference point or points established for such purpose.

Note.–The shape of the inner horizontal surface need not necessarily be circular. Guidance on determining the extent of the inner horizontal surface is contained in the Airport Services Manual, *Part 6.*

4.1.6 The height of the inner horizontal surface shall be measured above an elevation datum established for such purpose.

Note.–Guidance on determining the elevation datum is contained in the Airport Services Manual, *Part 6.*

Approach surface

4.1.7 *Description.– Approach surface.* An inclined plane or combination of planes preceding the threshold.

4.1.8 *Characteristics.–* The limits of the approach surface shall comprise:

a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance before the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway;

c) an outer edge parallel to the inner edge.

4.1.9 The elevation of the inner edge shall be equal to the elevation of the mid-point of the threshold.

4.1.10 The slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the runway.

Inner approach surface

4.1.11 *Description.– Inner approach surface.* A rectangular portion of the approach surface immediately preceding the threshold.

4.1.12 *Characteristics.–* The limits of the inner approach surface shall comprise:

a) an inner edge coincident with the location of the inner edge of the approach surface but of its own specified length;

b) two sides originating at the ends of the inner edge and extending parallel to the vertical plane containing the centre line of the runway;

c) an outer edge parallel to the inner edge.

Transitional surface

4.1.13 *Description.– Transitional surface.* A complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface.

4.1.14 *Characteristics.*– The limits of a transitional surface shall comprise:

a) a lower edge beginning at the intersection of the side of the approach surface with the inner horizontal surface and extending down the side of the approach surface to the inner edge of the approach surface and from there along the length of the strip parallel to the runway centre line;

b) an upper edge located in the plane of the inner horizontal surface.

4.1.15 The elevation of a point on the lower edge shall be:

a) along the side of the approach surface – equal to the elevation of the approach surface at that point;

b) along the strip – equal to the elevation of the nearest point on the centre line of the runway or its extension.

Note.–As a result of b) the transitional surface along the strip will be curved if the runway profile is curved or a plane if the runway profile is a straight line. The intersection of the transitional surface with the inner horizontal surface will also be a curved or a straight line depending on the runway profile.

4.1.16 The slope of the transitional surface shall be measured in a vertical plane at right angles to the centre line of the runway.

Inner transitional surface

Note.–It is intended that the inner transitional surface be the controlling obstacle limitation surface for navigational aids, aircraft and other vehicles that must be near the runway and which is not to be penetrated except for frangibly mounted objects. The transitional surface described in 4.1.13 is intended to remain as the controlling obstacle limitation surface for buildings, etc.

4.1.17 *Description.– Inner transitional surface.* A surface similar to the transitional surface but closer to the runway.

4.1.18 *Characteristics.*– The limits of an inner transitional surface shall comprise:

a) a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the inner edge of that surface, from there along the strip parallel to the runway centre line to the inner edge of the balked landing surface and from there up the side of the balked landing surface to the point where the side intersects the inner horizontal surface;

b) an upper edge located in the plane of the inner horizontal surface.

4.1.19 The elevation of a point on the lower edge shall be:

a) along the side of the inner approach surface and balked landing surface – equal to the elevation of the particular surface at that point;

b) along the strip – equal to the elevation of the nearest point on the centre line of the runway or its extension.

Note.–As a result of b) the inner transitional surface along the strip will be curved if the runway profile is curved or a plane if the runway profile is a straight line. The intersection of the inner transitional surface with the inner horizontal surface will also be a curved or straight line depending on the runway profile.

4.1.20 The slope of the inner transitional surface shall be measured in a vertical plane at right angles to the centre line of the runway.

Balked landing surface

4.1.21 *Description.– Balked landing surface.* An inclined plane located at a specified distance after the threshold, extending between the inner transitional surfaces.

4.1.22 *Characteristics.*– The limits of the balked landing surface shall comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance after the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the runway;

c) an outer edge parallel to the inner edge and located in the plane of the inner horizontal surface.

4.1.23 The elevation of the inner edge shall be equal to the elevation of the runway centre line at the location of the inner edge.

4.1.24 The slope of the balked landing surface shall be measured in the vertical plane containing the centre line of the runway.

Take-off climb surface

4.1.25 *Description.– Take-off climb surface.* An inclined plane or other specified surface beyond the end of a runway or clearway.

4.1.26 *Characteristics.*– The limits of the take-off climb surface shall comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located either at a specified distance beyond the end of the runway or at the end of the clearway when such is provided and its length exceeds the specified distance;

b) two sides originating at the ends of the inner edge, diverging uniformly at a specified rate from the take-off track to a specified final width and continuing thereafter at that width for the remainder of the length of the take-off climb surface;

c) an outer edge horizontal and perpendicular to the specified take-off track.

4.1.27 The elevation of the inner edge shall be equal to the highest point on the extended runway centre line between the end of the runway and the inner edge except that when a clearway is provided the elevation shall be equal to the highest point on the ground on the centre line of the clearway.

4.1.28 In the case of a straight take-off flight path, the slope of the take-off climb surface shall be measured in the vertical plane containing the centre line of the runway.

4.1.29 In the case of a take-off flight path involving a turn, the take-off climb surface shall be a complex surface containing the horizontal normals to its centre line, and the slope of the centre line shall be the same as that for a straight take-off flight path.

4.2.–Obstacle limitation requirements

Note.–The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a runway, i.e. take-off or landing and type of approach, and are intended to be applied when such use is made of the runway. In cases where operations are conducted to or from both directions of a runway then the function of certain surfaces may be nullified because of more stringent requirements of another lower surface.

Non-instrument runways

4.2.1 The following obstacle limitation surfaces shall be established for a non-instrument runway:

conical surface
inner horizontal surface
approach surface
transitional surfaces.

4.2.2 The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 4-1.

4.2.3 New objects or extensions of existing objects shall not be permitted above an approach or transitional surface except when, in the opinion of the Appropriate Authority, the new object or extension would be shielded by an existing immovable object.

Note.–Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.4 Recommendation.– *Existing objects above any of the surfaces required by 4.2.1 should as far as practicable be removed and new objects or extensions of existing objects should not be permitted above the conical surface or inner horizontal surface, except, when, in the opinion of the Appropriate Authority, the object is or would be shielded by an existing immovable object or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

Note.–Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip be removed unless it is considered they may endanger aeroplanes.

4.2.5 Recommendation.– *In considering proposed construction account should be taken of the possible future development of an instrument runway and consequent requirement for more stringent obstacle limitation surfaces.*

Instrument approach runways and precision approach runways category I

4.2.6 The following obstacle limitation surfaces shall be established for an instrument approach runway or a precision approach runway category I:

conical surface
inner horizontal surface
approach surface
transitional surfaces.

4.2.7 The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 4-1, except in the case of the horizontal section of the approach surface (see 4.2.8).

4.2.8 The approach surface shall be horizontal beyond the point at which the 2.5 per cent slope intersects:

a) a horizontal plane 150 m (500 ft) above the threshold elevation; or

b) the horizontal plane passing through the top of any object that governs the obstacle clearance limit;

whichever is the higher.

4.2.9 New objects or extensions of existing objects shall not be permitted above an approach surface within 3 000 m (10 000 ft) of the inner edge or above a transitional surface except when, in the opinion of the Appropriate Authority, the new object or extension would be shielded by an existing immovable object.

Note.–Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.10 Recommendation.– *Existing objects above any of the surfaces required by 4.2.6 should as far as practicable be removed and new objects or extensions of*

Table 4-2.–Dimensions and Slopes of Obstacle Limitation Surfaces

TAKE-OFF RUNWAYS

Runway Classification / Surface and Dimensions[a]	Main take-off runways	Other runways		
	A, B, C	A, B, C	D	E
1	2	3	4	5
TAKE-OFF CLIMB				
Length of inner edge	180 m (600 ft)	180 m (600 ft) [150 m (500 ft)][b]	80 m (260 ft)	60 m (200 ft)
Distance from runway end[d]	60 m (200 ft)	60 m (200 ft)	30 m (100 ft)	30 m (100 ft)
Divergence (each side)	12.5%	12.5% [10%][b]	10%	10%
Final width	1 200 m (4 000 ft) 1 800 m[c] (6 000 ft)[c]	1 200 m (4 000 ft) 1 800 m[c] (6 000 ft)[c]	580 m (1 900 ft)	380 m (1 250 ft)
Length	15 000 m (50 000 ft)	12 000 m (40 000 ft)	2 500 m (8 300 ft)	1 600 m (5 200 ft)
Slope	2%	2.5%	4%	5%

a. All dimensions are measured horizontally unless specified otherwise.
b. See 4.2.18.
c. 1 800 m (6 000 ft) when the intended track includes changes of heading greater than 15° for operations conducted in IMC, VMC by night.
d. Or end of clearway if the clearway length exceeds the specified distance.

for the slope specified in Table 4-2 to be reduced. The degree of this reduction depends on the divergence between local conditions and sea level standard atmospheric conditions, and on the performance characteristics and operational requirements of the aeroplanes for which the runway is intended.

4.2.20 New objects or extensions of existing objects shall not be permitted above a take-off climb surface except when, in the opinion of the Appropriate Authority, the new object or extension would be shielded by an existing immovable object.

Note.–Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.21 Recommendation.– *If no object reaches the 2 per cent (1:50) take-off climb surface of the main take-off runway, new objects should be limited to preserve the existing obstacle free surface or a surface down to a slope of 1.6 per cent (1:62.5).*

4.2.22 Recommendation.– *Existing objects that extend above a take-off climb surface should as far as practicable be removed except when, in the opinion of the Appropriate Authority, an object is shielded by an existing immovable object or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

Note.–Because of transverse slopes on a strip or clearway, in certain cases portions of the inner edge of the take-off climb surface may be below the corresponding elevation of the strip or clearway. It is not intended that the strip or clearway be graded to conform with the inner edge of the take-off climb surface nor is it intended that terrain or objects which are above the take-off climb surface beyond the end of the strip or clearway but below the level of the strip or clearway be removed unless it is considered they may endanger aeroplanes. Similar considerations apply at the junction of a clearway and strip where differences in transverse slopes exist.

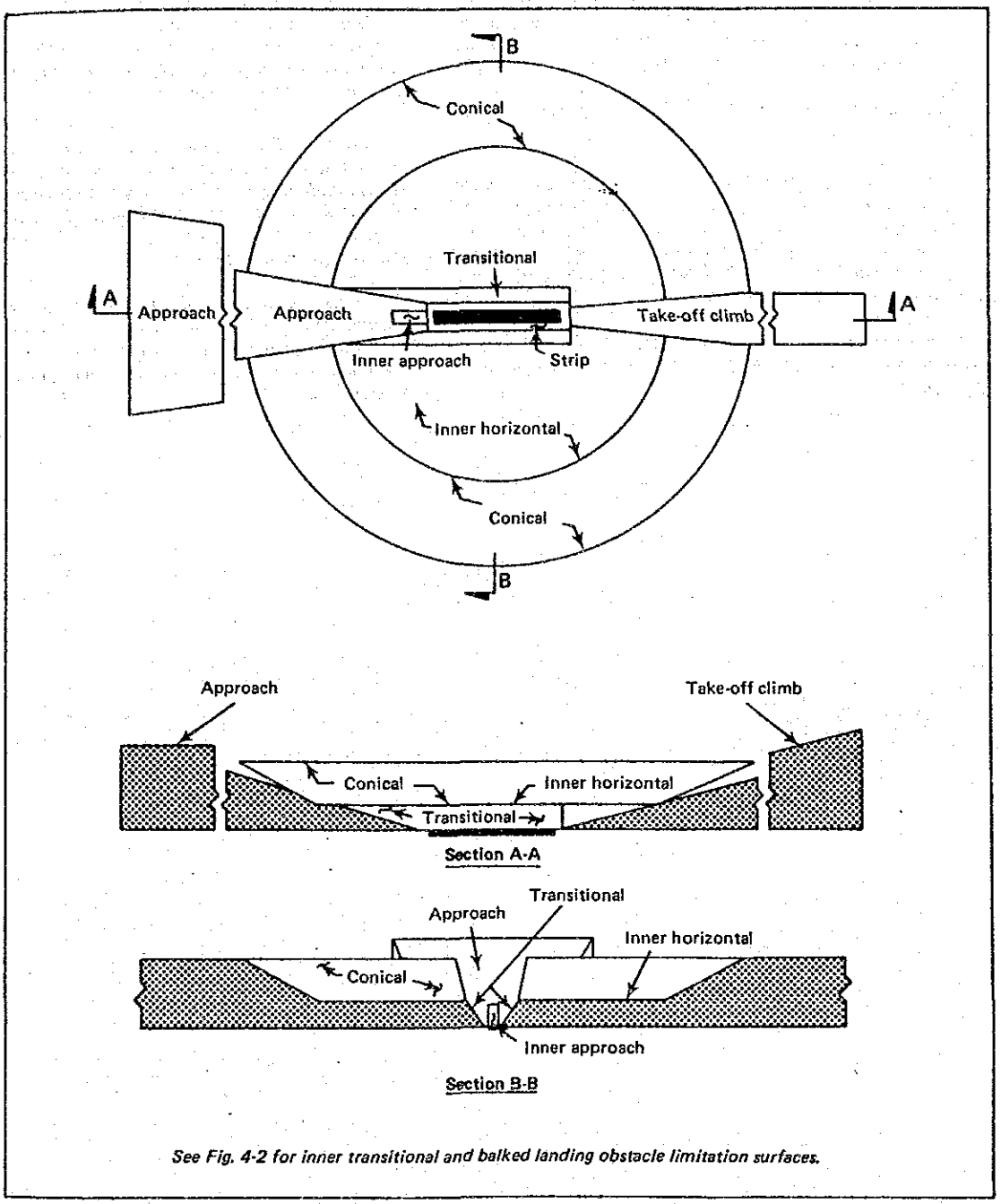

Figure 4-1. Obstacle limitation surfaces

4.3.–Objects outside the obstacle limitation surfaces

4.3.1 Recommendation.– *Arrangements should be made to enable the Appropriate Authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by that Authority in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.*

4.3.2 Recommendation.– *In areas beyond the limits of the obstacle limitation surfaces at least those objects which extend to a height of 150 m (500 ft) or more above ground elevation should be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes.*

Note.–This study may have regard to the nature of operations concerned and may distinguish between day and night operations.

4.4.–Other objects

4.4.1 Recommendation.– *Objects which do not project through the approach surface but which would nevertheless adversely affect the optimum siting or performance of visual or non-visual aids should, as far as practicable, be removed.*

4.4.2 Recommendation.– *Anything which may, in the opinion of the Appropriate Authority after aeronautical study, endanger aeroplanes on the movement area or in the air within the limits of the inner horizontal and conical surfaces should be regarded as an obstacle and should be removed in so far as practicable.*

Note.–In certain circumstances, objects that do not project above any of the surfaces enumerated in 4.1 may constitute a hazard to aeroplanes as, for example, where there are one or more isolated objects in the vicinity of an aerodrome.

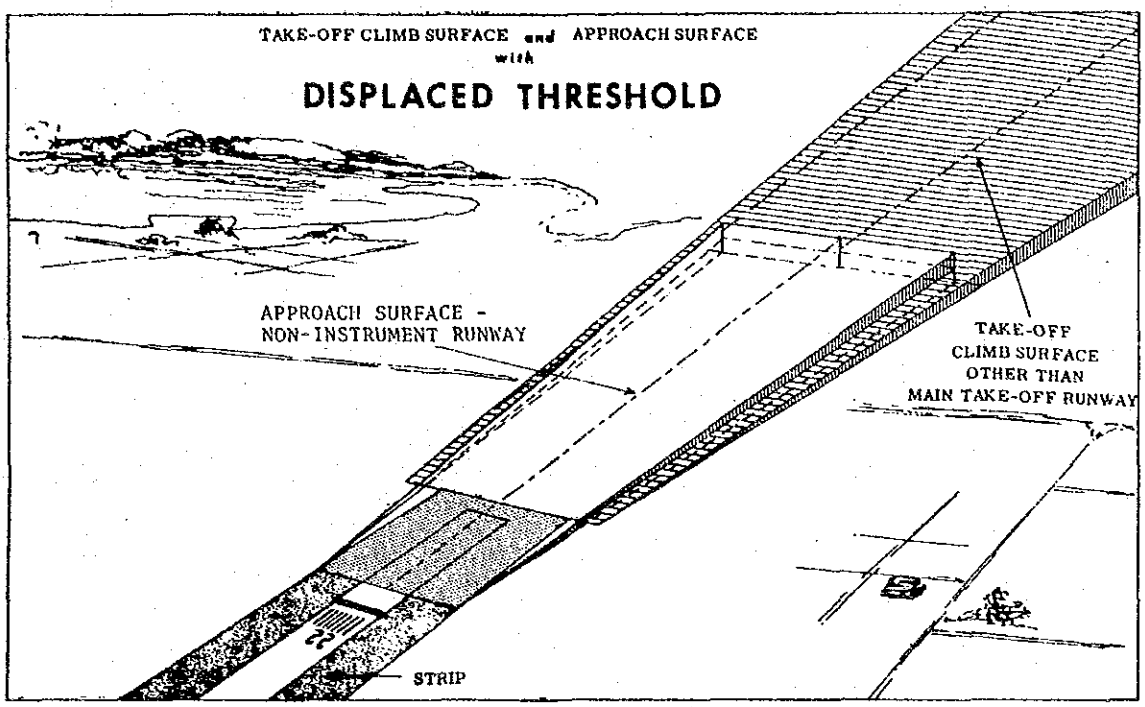

Figure A-4

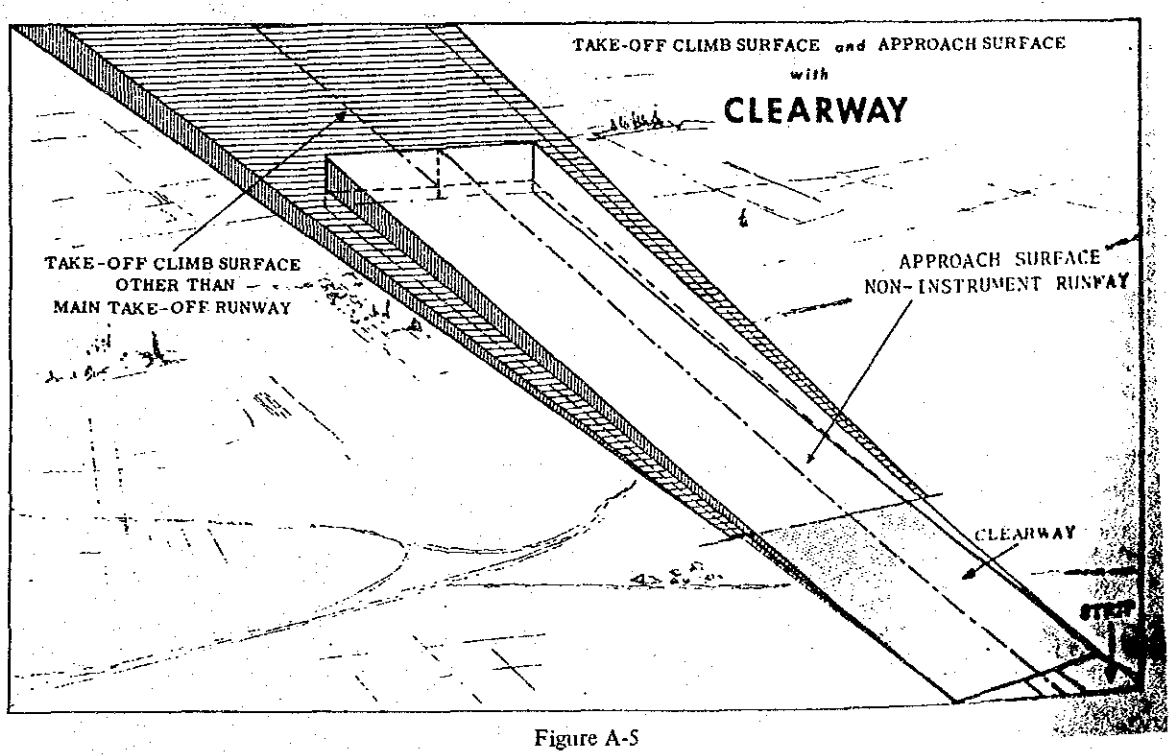

Figure A-5