REFERENCE DATA

1. Average Basin Rainfall Calculated by Isohyetal Chart Method
2. Correlation between Isohyetal Method and Thiessen Method
3. Correlation between $\bar{R}_7$ and $\bar{R}_6$ (Monthly Rainfall and 7 Days Rainfall), and Correlation between Rainfall at Pilok and Average Rainfall in Mae Klong Basin
4. Time Difference between Peak Occurrence Day of Rainfall at 7 Stations and That of Average of Rainfall in Maeklong Basin
5. Peak Occurrence Day of Average Basin Rainfall and K-10 Peak Discharge
6. 7 Days Rainfall and Peak Discharge
7. Base Flow (Q_B) and Rainfall in Preceding 1 Month
8. Error in Average Value Computation
9. Observed and Computed Hydrographs (R = 0 after T + 1 for forecasting)
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11. Observed and Computed Hydrographs (Forecasting of T + 2 days; time distribution changed)
12. Example of Verification Computation of 4 Cases (Maeklong Flood Simulation Data)
13. Rating Curve Computation Sheet (Example)

Average Basin Rainfall Calculated by Isohyetal Chart Method

1966 21. Jul. ~ 2 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
500	854	600	512,400	
400~500	1003	450	451,350	
300~400	1164	350	407,400	
200~300	1821	250	455,250	
100~200	1697	150	254,550	
~100	470	60	28,200	
Total	7008		2,109,150	
		Rave	300.96	

1966 2 Sep. ~ 15 Sep.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
800~	247	860	212,420	
700~800	272	750	204,000	
600~700	346	650	224,900	
500~600	433	550	238,150	
400~500	681	450	306,450	
300~400	904	350	316,400	
200~300	1771	250	442,750	
100~200	1970	150	295,500	
~100	384	80	30,720	
Total	7008		2,271,290	
		Rave	324,09	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1967 9 Aug. ~ 26 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
100~	99	1080	106,920	
900~1000	173	950	164,350	
800 ~ 900	223	850	189,550	
700 ~ 800	272	750	204,000	
600 ~ 700	371	650	241,150	
500 ~ 600	669	550	367,950	
400 ~ 500	718	450	323,100	
300 ~ 400	941	350	329,350	
200 ~ 300	1164	250	291,000	
100 ~ 200	1809	150	271,350	
~ 100	509	50	28,450	
Total	7008		2,517,170	
		Rave	359.18	

1967 31 Jul. ~ 8 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
600~	185	700	129,500	
500~600	210	550	115,500	
400~500	445	450	200,250	
300~400	1003	350	351,050	
200~300	1449	250	374,750	
100~200	2378	150	356,700	
~100	1288	50	64,400	
Total	7008		1,592,150	
		Rave	227.19	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1967 27 Aug. ~ 15 Sep.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
700~	173	750	129,750	
600~700	198	650	128,700	
500~600	445	550	244,750	
400~500	706	450	317,700	
300~400	953	350	333,550	
200~300	1771	250	442,750	
100~200	2019	150	302,850	
~100	743	80	59,440	
Total	7008		1,959,490	
		Rave	279.60	

1968 5 Aug. ~ 18 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
800~	284	880	249,920	
700~800	272	750	204,000	
600~700	260	650	169,000	
500~600	346	550	190,300	
400~500	483	450	217,350	
300~400	681	350	238,350	
200~300	1375	250	343,750	
100~200	1870	150	280,500	
~100	1437	50	71,850	
Total	7008		1,965,020	
		Rave	280.39	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1969 22 Jul. ~ 29 Jul.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
300~	1077	350	376,950	
200~300	1597	250	399,250	
100~200	1795	150	269,250	
~100	2539	45	174,255	
Total	7008		1,159,705	
		Rave	165.48	

1969 30 Jul. ~ 26 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
1000~	198	1080	213,840	
900~1000	198	950	188,100	
800 ~ 900	297	850	252,450	
700 ~ 800	421	750	315,750	
600 ~ 700	755	650	490,750	
500 ~ 600	1201	550	660,550	
400 ~ 500	1350	450	607,500	
300 ~ 400	1177	350	411,950	
200 ~ 300	867	250	216,750	
100 ~ 200	346	150	51,900	
~100	198	80	15,840	
Total	7008		3,425,380	
		Rave	488.78	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1970 11 Jul. ~ 19 Jul.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
600~	297	680	201,960	
500~600	334	550	183,700	
400~500	693	450	311,850	
300~400	805	350	281,750	
200~300	1486	250	371,500	
100~200	1994	150	299,100	
~100	1399	50	69,950	
Total	7008		1,719,810	
		Rave	245.41	

1971 17 Jul.~ 29 Jul.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
700~	198	780	154,440	
600~700	247	650	160,550	
500~600	482	550	265,100	
400~500	929	450	418,050	
300~400	1313	350	459,550	
200~300	2044	250	511,000	
100~200	1226	150	183,900	
~100	569	80	45,520	
Total	7008		2,198,110	
		Rave	313.65	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1972 30 Jun. ~ 18 Jul.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
1000~	173	1100	190,300	
900~1000	198	950	188,100	
800 ~900	396	850	336,600	
700 ~800	619	750	464,250	
600 ~700	656	650	426,400	
500 ~600	904	550	497,200	
400 ~500	1276	450	574,200	
300 ~400	1349	350	542,150	
200 ~300	594	250	148,500	
100 ~200	594	150	89,100	
~100	49	80	3,920	
Total	7008		3,460,720	
		Rave	493.82	

1972 19 Jul. ~ 10 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
800~	532	900	478,800	
700~800	496	750	372,000	
600~700	594	650	386,100	
500~600	879	550	483,450	
400~500	1052	450	473,400	
300~400	1511	350	528,850	
200~300	1325	250	331,250	
100~200	446	150	66,900	
~100	173	80	13,840	
Total	7008		3,134,590	
		Rave	447.28	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1973 11 Jun. ~ 30 Jun.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
900~	247	980	242,060	
800~900	247	850	209,950	
700~800	396	750	185,250	
600~700	632	650	410,800	
500~600	855	550	470,250	
400~500	1028	450	462,600	
300~400	1423	350	498,050	
200~300	1524	250	381,000	
100~200	607	150	91,050	
~100	49	90	4,410	
Total	7008		2,955,420	
		Rave	421.72	

1973 15 Aug. ~ 10 Sep.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
1000~	173	1300	224,900	
900~1000	185	950	175,750	
800 ~ 900	309	850	262,650	
700 ~ 800	384	750	288,000	
600 ~ 700	408	650	265,200	
500 ~ 600	582	550	320,100	
400 ~ 500	892	450	401,400	
300 ~ 400	1474	350	515,900	
200 ~ 300	1920	250	480,000	
~ 200	681	160	108,960	
Total	7008		3,042,860	
		Rave	434.19	

Average Basin Rainfall Calculated by Isohyetal Chart Method

1974 9 Aug. ~ 28 Aug.

1 Rainfall (mm)	2 Area (km^2)	3 Average Rainfall (mm)	2 × 3	Remarks
1000~	161	1300	209,300	
900~1000	173	950	164,350	
800 ~ 900	223	850	189,550	
700 ~ 800	284	750	213,000	
600 ~ 700	458	650	297,700	
500 ~ 600	706	550	388,300	
400 ~ 500	1003	450	451,350	
300 ~ 400	1301	350	455,350	
200 ~ 300	1548	250	387,000	
100 ~ 200	966	150	144,900	
~ 100	185	80	14,800	
Total	7008		2,915,600	
		Rave	416.04	

Ap-2-1 Correlation between Isohyet Method and Thiessen Method

	ISOHYET ($\bar{R}$>m,m)	THIESSEN ($\bar{R}$>m,m)[BY 7 STATION]
	x	y
1	416.04(1974, $9^{Aug}_{\sim}\cdot 28^{Aug}$.)	420.70
2	434.19(1973, $15^{Aug}_{\sim}\cdot 10^{Sep}$.)	405.30
3	421.72(1973, $11^{Jun}_{\sim}\cdot 30^{Jun}$.)	411.80
4	447.28(1972, $19^{Jun}_{\sim}\cdot 10^{Aug}$.)	391.10
5	493.82(1972, $30^{Jun}_{\sim}\cdot 18^{Jul}$.)	502.10
6	313.65(1911, $17^{Jul}_{\sim}\cdot 29^{Jul}$.)	299.00
7	245.41(1970, $11^{Jul}_{\sim}\cdot 19^{Jul}$.)	206.70
8	165.48(1969, $22^{Jul}_{\sim}\cdot 29^{Jul}$.)	156.30
9	488.78(1969, $30^{Jul}_{\sim}\cdot 26^{Aug}$.)	482.70
10	280.39(1968, $5^{Aug}_{\sim}\cdot 18^{Aug}$.)	234.30
11	359.18(1967, $9^{Aug}_{\sim}\cdot 26^{Aug}$.)	301.20
12	279.60(1967, $27^{Aug}_{\sim}\cdot 15^{Sep}$.)	254.80
13	227.19(1967, $31^{Jul}_{\sim}\cdot 8^{Aug}$.)	202.20

$$\begin{cases} \gamma = 0.983 \\ y = 1.047x - 39.958 \end{cases}$$

	ISOHYET ($\bar{R}$>m.m)	THIESSEN ($\bar{R}$>m.m)[BY 6 STATION]
	x	y
1	416.04	377.90
2	434.19	355.20
3	421.72	360.90
4	447.28	351.70
5	493.82	455.90
6	313.65	273.10
7	245.41	163.80
8	165.48	140.90
9	488.78	435.20
10	280.39	185.90
11	359.18	233.70
12	279.60	219.20
13	227.19	165.20

γ = 0.965

= 0.982x - 59.341

* Thiessen R_6 ~ R_7 (N=13)

γ = 0.99453

y = 1.0427x + 30.7259

Ap-3-1 Correlation between $\bar{R}_7$ and $\bar{R}_6$ (Monthly Rainfall)

9 Years from 1967 to 1975

Year	Month	x $\bar{R}_6$	y $\bar{R}_7$		x $\bar{R}$	y $\bar{R}_7$		x $\bar{R}$	y $\bar{R}_7$
1967	Apr.	79.0	76.7	1970	96.8	106.1	1973	26.7	26.1
	May.	188.4	220.6		190.2	221.2		162.7	180.2
	Jun.	243.2	275.9		191.2	243.0		472.0	541.9
	Jul.	295.4	351.0		330.3	408.7		293.5	397.4
	Aug.	457.4	568.1		257.7	322.0		350.8	412.3
	Sep.	264.2	298.5		261.4	300.1		299.5	344.5
	Oct.	158.8	182.6		139.3	154.7		85.8	91.9
	Nov.	61.8	62.3		32.1	36.1		12.9	13.4
	Dec.	0	0		21.6	20.8		0	0
	Jan.	0	0		0	0		0	0
	Feb.	29.2	27.6		27.3	27.0		17.7	17.6
	Mar.	20.2	19.0		47.0	49.8		91.0	89.5
1968		152.3	159.9	1971	95.8	96.6	1974	165.8	170.4
		152.4	159.1		149.1	161.2		365.1	382.4
		235.8	264.2		388.4	465.7		344.0	371.3
		358.0	428.2		253.1	277.4		495.5	529.0
		282.6	314.1		180.4	204.6		204.9	225.1
		155.3	156.6		130.4	141.2		180.1	208.2
		9.7	10.7		38.8	37.3		38.4	37.4
		1.0	1.0		1.8	1.7		2.3	2.3
		13.7	13.5		0	0		37.9	42.3
		0.2	0.2		11.5	11.6		22.8	24.4
		38.5	37.1		43.1	45.7		60.4	56.5
1969		68.4	68.2	1972	147.5	155.1	1975	21.1	22.3
		345.1	377.4		192.0	221.8		229.7	235.1
		268.2	310.2		399.4	457.9		402.0	448.5
		400.5	427.9		693.7	768.9		244.2	272.3
		461.4	516.6		308.0	363.6		357.7	419.2
		281.9	329.8		366.7	382.0		249.6	262.4
		153.8	154.8		125.6	138.1		188.0	198.2
		34.4	34.1		71.9	78.5		39.4	40.5
		0	0		0.1	0.1		0	0
		15.6	16.4		0	0		2.2	2.0
		21.8	27.3		45.0	49.1		51.7	49.7

$\gamma = 0.99668$ $y = 1.1396x - 2.9102$ $N = 108$

Ap-3-2 Correlation between $\bar{R}_6$ and $\bar{R}_7$ (7 Days Ratnfall)

Year	Month	x $\bar{R}_6$	y $\bar{R}_7$	Pilok R_p	Year	Month	x $\bar{R}_6$	y $\bar{R}_7$	Pilok R_p
1967	Jul.				1972	Jun.			
	21 ~ 27	134.4	154.2	212.0		4 ~ 10	184.4	222.2	597.8
	Aug.					Jun. Jul.			
	2 ~ 8	137.4	170.2	603.0		27 ~ 3	82.0	100.6	297.8
	Aug.					Jul.			
	13 ~ 19	147.5	192.1	757.8		3 ~ 9	91.9	107.2	316.7
	Aug. Sep.					Jul			
	27 ~ 2	118.5	134.9	344.6		9 ~ 16	329.3	352.7	668.4
	Sep. Oct.					Jul. Aug.			
	26 ~ 2	81.2	96.2	249.0		26 ~ 1	123.4	141.6	363.0
1968	Jul.					Aug.			
	23 ~ 29	91.9	110.2	334.6		14 ~ 20	79.0	98.9	350.7
	Aut.					23 ~ 29	58.0	70.6	253.5
	29 ~ 4	79.8	90.6	213.0		25 ~ 31	69.8	88.8	324.5
	Aug.					Sep.			
	10 ~ 10	133.3	164.5	536.0		3 ~ 9	133.5	138.8	185.1
	Aug.					17 ~ 23	101.1	105.0	129.5
	16 ~ 22	78.3	97.7	307.0		Sep. Oct			
	Sep.					29 ~ 5	67.7	79.3	170.0
	8 ~ 14	104.2	120.0	310.2		Jul.			
1969	Jul.					22 ~ 28	175.8	188.6	355.5
	16 ~ 22	110.3	127.1	375.6	1973	Jun.			
	Jul.					12 ~ 18	286.2	329.6	775.7
	24 ~ 30	129.5	140.4	297.6		Jul.			
	Aug.					8 ~ 14	66.1	105.7	541.1
	2 ~ 8	224.9	260.5	629.6		10 ~ 16	91.9	122.7	474.2
	Sep.					16 ~ 22	98.2	122.6	405.7
	2 ~ 8	91.7	106.9	263.0		Aug.			
	Sep.					11 ~ 17	68.3	93.6	383.7
	16 ~ 22	121.2	135.5	275.6		22 ~ 28	154.9	177.1	584.7
	Sep. Aug.					Sep.			
	27 ~ 3	91.1	93.0	106.4		6 ~ 12	60.3	76.6	233.0
1970	Jul.					17 ~ 23	109.1	125.6	252.3
	11 ~ 17	159.6	201.9	597.4	1974	May.			
	Aug.					25 ~ 31	145.1	159.7	377.5
	14 ~ 20	93.1	123.8	457.2		Jun.			
	21 ~ 27	79.9	96.4	303.2		6 ~ 12	92.0	106.6	306.2
	Sep.					Jun.			
	1 ~ 7	75.1	96.5	338.2		10 ~ 16	77.2	98.4	318.1
1971	Jur					Jul.			
	5 ~ 11	174.0	222.3	729.9		25 ~ 31	99.4	95.1	66.6
	16 ~ 22	109.9	132.9	462.7		Aug.			
	Jul					12 ~ 18	306.8	335.2	799.1
	8 ~ 14	96.0	117.2	319.4		Oct			
	Jun					8 ~ 14	102.6	91.1	160.7
	22 ~ 28	203.8	218.0	476.6		Aug. Sep.			
						29 ~ 4	83.1	79.7	139.8

$(\bar{R}_6 \sim \bar{R}_7)$

N = 51

Y = 0.98390

y = 1.07762x + 10.027

$(\bar{R}_7 \sim$ Pilok)

N = 51

Y = 0.80921

y = 0.29400x + 29.675

Ap-3-3 Correlation between Rainfall at Pilok and Average Rainfall in Maeklong Basin (Isohyetal and Thiessen Methods)

No.	Pilok x	Isohyet Method y_1	Thessen Method y_2
1	1,094.2	416.04	420.70
2	1,114.9	434.19	405.30
3	962.9	421.72	411.8
4	872.5	447.28	391.1
5	1,081.0	493.82	503.10
6	705.0	313.65	299.0
7	608.0	245.41	206.7
8	359.8	165.48	156.30
9	1,025.4	488.78	482.70
10	804.2	280.39	234.30
11	712.0	279.60	254.80
12	1,071.4	359.18	301.20
13	680.8	227.19	202.20
14	824.0	324.09	
15	506.4	300.96	

* 7 stations covered by Thiessen method

$x \sim y_1$ (N=15)

$\gamma = 0.8575$

$y_1 = 0.3689x + 41.0186$

$x \sim y_2$ (N=13)

$\gamma = 0.8480$

$y_2 = 0.4166 - 27.0919$

Ap-4-1 Time Difference between Peak Occurrence Day of Rainfall at 7 Stations and That of Average Rainfall in Maeklong Basin

Year	Month	Basin's Average	Sangkla buri		Pilok		Ban Pa Tho		Thong Pha Phum		Lin Tin		Huai Mae Nam Noi		Lum Sum	
1967	Jun.	5	5	0	5	0	3	-2	5	0	5	0	5	0	5	0
	Jul.	7	8	1	6	-1	3	-4	7	0	9	2	7	0	8	1
	"	24	24	0	24	0	25	1	24	0	22	-2	24	0	26	2
	Aug.	6	4	-2	7	1	6	0	3	-3	1	-5	6	0	6	0
	"	17	17	0	16	-1	16	-1	17	0	14	-3	17	0	16	-1
	Sep.				Aug.				Aug.		Aug.					
		2	1	-1	31	-2	1	-1	29	-4	31	-2	1	-1	1	-1
	Oct		Aug.													
		1	28	-4	1	0	-	-	1	0	1	0	1	0	1	0
1968	Jul.	29	29	0	26	-3	28	-1	26	-3	29	0	30	1	29	0
	Aug.										Jul					
		2	2	0	2	0	3	1	2	0	31	-2	3	1	4	2
	"	14	13	-1	14	0	12	-2	14	0	12	-2	14	0	11	-3
	"	21	19	-2	19	-2	21	0	21	0	20	-1	21	0	21	0
	Sep.	12	11	-1	11	-1	11	-1	11	-1	13	1	12	0	12	0
1969	May.	28	28	0	28	0	30	2	28	0	29	1	29	1	29	-1
	Jun.	18	16	-2	18	0	20	2	16	-2	19	+1	18	0	19	1
	Jul.	18	18	0	17	-1	21	3	18	0	18	-1	19	1	17	-1
	"	27	27	0	26	-1	26	-1	26	-1	27	0	27	0	28	1
	Aug.	6	6	0	6	0	5	-1	6	0	6	0	6	0	7	1
	Sep.	7	7	0	3	-4	5	-2	7	0	7	0	3	-4	8	1
	"	21	19	-2	21	0	21	0	21	0	21	0	18	-3	19	-2
	Oct				Sep.		Sep.								Sep.	
		2	2	0	30	-2	30	-2	2	0	3	1	2	0	30	-2
1970	Jul.	15	15	0	15	0	12	-3	15	0	14	-1	15	0	16	1
	Aug.	19	19	0	19	0	20	1	19	0	15	-4	18	-1	21	2
	"	24	22	-2	24	0	24	0	24	0	26	2	26	2	25	1
	Sep	6	6	0	6	0	7	1	6	0	6	0	5	-1	6	0
1971	Jun.	9	9	0	8	-1	7	-2	10	1	11	2	10	1	11	2
	"	20	17	-3	20	0	20	0	20	0	20	0	18	-2	20	0
	Jul.	13	14	1	13	0	10	-3	14	1	13	0	14	1	13	0
	"	25	23	-2	23	-2	26	1	23	-2	24	-1	25	0	31	6
	Aug.	21	22	1	22	1	20	-1	21	0	21	0	21	0	22	-1
	Sep.		Aug.				Aug.									
		1	31	-1	1	0	30	-2	31	-1	4	3	1	0	31	-1
	"	18	18	0	18	0	17	-1	18	0	18	0	18	0	18	0
	"	10	9	-1	12	2	11	1	7	-3	8	2	10	0	10	0
1972	Jun.	8	8	0	8	0	6	-2	9	1	7	-1	8	0	5	-3
	"	17	17	0	16	-1	17	0	18	1	17	0	17	0	14	-3
	"	28	28	0	25	-3	28	0	29	1	26	-2	23	-5	30	2
	Jul.	11	13	2	8	-3	11	0	11	0	12	1	12	1	11	0

Ap-4-2 Time Difference between Peak Occurrence Day of Rainfall at 7 Stations and That of Average Rainfall in Mae Klong Basin

Year	Month	Basin's Average	Saangkla buri	Pilok	Ban Pa Tho	Thong Pha Phum	Lin Tin	Huai Mae Nam Noi	Lum Sum
1972	Jul.	24	24 0	24 0	24 0	24 0	24 0	24 0	21 -3
	Aug.	18	19 1	18 0	20 2	18 0	20 2	16 -2	16 -2
	Sep.	6	3 -3	7 1	5 -1	6 0	11 5	6 0	6 0
	"	18	18 0	18 0	18 0	18 0	24 6	18 0	18 0
1973	Jun	17	15 -2	17 0	18 1	17 0	17 0	17 0	17 0
	Jul.	12	12 0	12 0	11 -1	12 0	12 0	12 0	10 -2
	"	16	16 0	16 0	16 0	16 0	16 0	16 0	16 0
	Aug.	24	22 -2	22 -2	27 3	24 0	24 0	24 0	24 0
	Sep.	20	23 3	22 2	16 -4	18 -2	18 -2	21 1	17 -3
1974	May	29	30 1	29 0	27 -2	30 1	29 0	29 0	31 2
	Jun.	7	9 2	7 0	7 0	4 -3	4 3	7 0	3 -4
	"	14	14 0	13 -1	12 -2	13 -1	11 -3	15 1	14 0
	"	23	22 -1	23 0	25 2	23 0	20 -3	23 0	19 -4
	Jul.	7	7 0	5 -2	4 -3	7 0	4 -3	5 -2	7 0
	"	29	29 0	29 0	25 -4	27 -2	26 -3	29 0	24 -5
	Aug.	16	16 0	15 -1	17 1	17 1	12 -4	17 -4	15 -1
	Oct.	11	- -	11 0	6 -5	11 0	9 -2	11 0	11 0
	n		52	53	52	53	53	53	53
	Ave		-0.38	-0.55	-0.62	-0.40	-0.42	-0.26	-0.34
			1.29	1.16	1.76	1.15	2.07	1.31	1.87
	Ratio of time difference within ±1 day		37/52 =0.712	41/53 =0.774	30/52 =0.577	44/53 =0.830	29/53 =0.547	45/53 =0.849	34/53 =0.642

In each column { left values: Date
right values: Difference

Ap-5-1 Peak Occurrence Day of Average Basin Rainfall and K-10 Water Stage

Year	H		$\bar{R}$	Time Difference in Peak Occurrence between H and $\bar{R}$
	Date	H	Date	
1967	8 Jun.	34.94	5	3
	12 Jul.	32.91	7	5
	28 Jul.	37.76	24	4
	9 Aug.	41.67	6	3
	20 Aug.	43.80	17	3
	4 Sep.	38.41	2	2
	4 Oct	38.80	1	3
1968	1 Aug.	36.20	29 Jul	3
	5	36.63	2	3
	17	41.22	14	3
	24	39.26	21	3
	15 Sep.	39.97	12	3
1969	1 Jun	35.17	28 May.	4
	22	35.11	18	4
	22 Jul.	37.72	18	4
	31	41.06	27	4
	11 Aug.	46.58	6	5
	10 Sep.	37.70	7	3
	24	40.33	21	3
	5 Oct.	38.24	2	3
1970	18 Jul	41.52	15	3
	22 Aug.	38.95	19	3
	27	38.51	24	3
	9 Sep.	38.14	6	3
1971	12 Jun.	38.92	9	3
	23	36.93	20	3
	17 Jul.	38.66	13	4
	28	44.74	25	3
	24 Aug.	37.62	21	3
	2 Sep.	37.12	1	1
	20	36.36	18	2
	13	34.92	10	3
1972	11 Jun.	41.16	8	3
	21	35.05	17	4
	1 Jul.	35.60	28 Jun.	3
	17	48.57	11	6

Ap-5-2 Peak Occurrence Day of Average Basin Rainfall and K-10 Water Stage

Year	H		$\bar{R}$	Time Difference in Peak Occurrence between H and $\bar{R}$
	Date	H	Date	
1972	27 Jul.	44.67	24	3
	22 Aug.	40.05	18	4
	9 Sep.	40.96	6	3
	21	39.80	18	3
1973	20 Jun.	44.05	17	3
	15 Jul.	38.98	12	3
	21	39.51	16	5
	27 Aug.	42.87	24	3
	25 Sep.	39.76	20	5
1974	2 Jun	36.11	29 May	4
	12	37.04	7	5
	17	38.27	14	3
	26	35.33	23	3
	10 Jul.	35.38	7	3
	1 Aug.	35.38	29 Jul.	3
	21	49.61	16	5
	14 Oct.	38.73	11	3

$n = 53$

Ave. $= 3.377$

$\sigma = 0.874$ $\qquad 2.5 < T1 < 4.25$

Ap-6-1 7 Days Rainfall and Peak Discharge

Flood Occurrence Day		Case 1 R	Case 2 R	Case 3 R	Case 4 R	Measured Discharge
1967	28 Jul.	154.2	110.6	139.0	77.2	558
	10 Aug.	170.2	161.7	168.0	130.3	1,239
	20 "	192.1	192.1	191.8	154.0	1,668
	4 Sep.	134.9	1268	134.9	97.1	1,257
	4 Oct.	196.2	102.4	96.2	81.2	727
1968	1 Aug.	110.2	98.0	101.2	78.9	4425
	5 "	90.6	90.3	91.8	94.3	468
	17 "	164.5	152.6	164.2	133.10	1,094
	25 "	97.7	104.7	97.7	119.2	839
	15 Sep.	120.0	121.1	123,80	97.4	879
1969	22 Jul.	127.1	103.8	107.7	83.4	560
	31	140.4	125.6	140.6	88.5	1,094
	11 Aug.	260.5	228.1	245.4	171.2	2,354
	10 Sep.	106.9	90.9	106.9	73.0	581
	24 "	135.5	140.3	135.5	99.6	964
	5 Oct.	93.1	83.3	93.0	43.5	635
1970	18 Jul.	201.9	164.2	187.6	109.7	1,165
	22 Aug.	123.8	124.9	123.8	102.0	709
	27 "	96.4	111.3	108.9	100.5	648
	9 Sep.	96.5	86.1	96.5	65.3	604
1971	12 Jun.	222.3	143.4	192.6	97.4	708
	21 "	132.9	127.9	131.8	106.5	451
	17 Jul.	117.2	115.1	117.2	99.6	672
	28 "	218.0	219.8	212.1	180.0	1,859
1972	11 Jun.	222.2	206.9	216.8	140.8	1,077
	1 Jul.	100.6	79.0	77.5	58.1	352
	8 Jul.	107.2	100.0	97.9	82.2	503
	17 "	352.7	206.4	271.6	119.1	3,026
	2 Aug.	141.6	141.6	139.7	136.8	1,709
	22	98.9	103.4	91.0	90.3	887
	28	70.6	60.6	60.0	58.2	705
	31	88.8	88.8	88.5	72.1	687
	9 Sep.	138.8	120.1	130.5	80.3	1,041
	21 "	105.0	73.7	76.7	32.7	850
	9 Oct.	79.3	70.9	73.2	63.3	552
	27 Jul.	188.6	151.0	158.8	104.2	1,846
1973	20 Jun.	329.6	317.3	329.6	240.4	1,728
	10 Jul.	105.7	101.2	102.7	88.4	767

Ap-6-2 7 Days Rainfall and Peak Discharge

Flood Occurrence Day		Case 1 R	Case 2 R	Case 3 R	Case 4 R	Measured Discharge
1973	15 Jul.	122.7	101.2	102.7	88.4	761
	21	122.6	122.4	122.6	112.4	835
	17 Aug.	93.6	65.4	71.8	52.6	435
	27	177.1	164.8	159.5	137.5	1,465
	14 Sep.	76.1	76.6	75.5	47.7	549
	25	125.6	83.1	100.5	58.2	872
1974	2 Jun.	159.7	188.8	162.4	165.9	400
	12	106.6	102.6	106.5	103.2	493
	17	98.4	109.2	103.4	105.3	640
	1 Aug.	95.1	102.1	98.0	87.3	374
	21	335.2	256.9	311.6	198.5	3,250
	14 Oct.	91.1	70.0	79.2	46.5	696
	5 Sep.	79.7	64.7	68.6	51.0	543

Correlation coefficient and regression formula — y → Case 1, x → Case 2, 3, 4

Case 2	$\gamma = 0.91582$	$y = 1.1333x - 1.913$
3	$\gamma = 0.97773$	$y = 1.0712x - 1.0270$
4	$\gamma = 0.77384$	$y = 1.22979x + 18.3911$

Ap-7 Q_B (Base Flow) and Rainfall in Preceding 1 Month

Year	Day	Jun		Jul		Aug		Sep		Oct	
		Q_B	ΣR	Q_B	ΣR	Q_B	ΣR	Q_B	ΣR	Q_B	ΣR
1967	1	39	220.6	67	275.9	198	351.0	390	568.1	220	298.5
	16	75	338.1	87	199.3	359	617.2	208	354.9	199	
1968	1	29	159.1	48	264.2	115	289.7	282	428.2	210	314.1
	16	42	183.5	74	244.4	276	429.1	290	376.5	189	
1969	1	74	377.4	97	310.2	270	427.9	328	516.6	212	329.8
	16	110	444.2	118	291.8	650	688.8	208	258	149	
1970	1	35	221.2	50	243.0	182	408.7	270	322.0	190	300.1
	16	39	218.8	102	430.7	168	264.5	226	363.4	159	
1971	1	32	161.2	124	465.9	390	517.7	250	277.4	165	204.6
	16	125	348.4	165	407	250	413.8	175	252.2	158	
1972	1	47	221.8	125	457.9	590	768.9	315	363.6	250	382.0
	16	156	509.5	610	623.3	410	487.5	300	375	191	
1973	1	28.5	180.2	230	541.9	238	397.4	410	412.3	260	344.5
	16	46	391.8	214	425	190	312.6	290	449.2	180	
1974	1	94	382.4	102	371.3	159	333.8	420	529	194	225.1
	16	113	526.3	122	305.9	299	457.5	252	354.7	165	
1975	1	31.7	235.1	68	448.5	113	272.3	260	419.2	199	262.4
	16	66	332.4	96	356.5	270	398.2	207	291.5	190	

Ap-8-1 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1967	8		15	.149	.168	.168	2.658	
		15	14	.220	.245	.270	1.691	
		16	13	.214	.222	.230	1.486	
		17	12	.425	.272	.257	2.843	
		18	11	.193	.166	.168	1.014	↑
		19	10	.230	.316	.223	.220	
		20	9	.149	.149	.133	.263	◎
		21	8	.217	.235	.237	.327	
		22	7	.336	.340	.291	.547	↓
		23	6	1.265	1.237	1.008	1.912	
		24	5	1.039	1.086	.868	.679	
		25	4	.091	.037	.100	.064	
		26	3	.072	.042	.052	.148	
		27	2	.255	.149	.010	.333	
		28	1	0.000	0.000	0.000	0.000	
		Ave		.237	.235	.219	1.172	
		σ		.084	.063	.050	.870	} i=9
		Cv		.355	.269	.226	.742	
		Ave		.324	.311	.268	.912	
		σ		.342	.348	.279	.854	} i=15
		Cv		1.057	1.119	1.041	.936	

$$E = \frac{1}{N} \Sigma \left(\frac{Qc - Qo}{Qop} \right)^2$$

where, N : Sample size

i : Number data used for average computation

◎ : Occurrence day of peak measured discharge

↑ : Time range recording a measured discharge of more than 1,000 m^3/s

↓

Ap-8-2 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1969	7	26	31	1.246	1.232	1.232	6.508	
		27	30	1.179	1.169	1.175	6.958	
		28	29	.988	.984	.940	3.466	
		29	29	1.041	1.038	1.178	1.908	
		30	27	1.105	1.055	1.085	2.663	
	8	31	26	1.122	1.088	1.145	2.450	
		1	25	1.108	1.084	1.095	1.967	
		2	24	.968	.983	1.713	1.614	
		3	23	1.011	1.050	5.695	2.785	
		4	22	1.290	1.339	6.235	3.190	
		5	21	1.062	1.140	3.243	1.739	
		6	20	.795	.867	.959	2.844	
		8	19	.809	.835	.809	3.236	
		9	18	.760	.758	.998	3.577	
		9	17	1.052	.958	1.451	3.166	
		10	16	.620	.679	.634	1.501	
		11	15	.654	.761	.342	1.545	
		12	14	.757	.865	.383	1.845	
		13	13	1.168	1.035	.692	2.595	
		14	12	1.540	1.700	.985	3.354	
		15	11	.983	1.099	.547	2.854	
		16	10	1.032	.925	.643	2.997	
		17	9	1.629	1.161	1.168	2.470	
		18	8	3.283	2.307	2.376	5.701	
		19	7	6.407	4.676	6.257	8.977	
		20	6	7.762	6.038	9.114	7.840	
		21	5	6.119	5.082	6.613	6.030	
		22	4	4.452	3.770	3.648	3.662	
		23	3	.402	.392	.115	.054	
		24	2	.674	.505	.269	.140	
		25	1	0.000	0.000	0.000	0.000	
		Ave		1.040	1.035	1.493	2.923	
		σ		.243	.211	1.492	1.336	}i=23
		Cv		.234	.204	.999	.457	
		Ave		1.710	1.502	2.024	3.214	
		σ		1.845	1.809	2.275	2.138	}i=31
		Cv		1.079	.932	1.124	.665	

Ap-8-3 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1970	7	14	12	2.651	2.589	2.589	11.714	
		15	11	2.982	2.928	2.928	12.367	
		16	10	4.054	4.406	2.110	1.777	
		17	9	10.068	10.467	7.006	5.562	
		18	8	1.091	2.158	.927	3.214	◎
		19	7	.796	1.378	.711	1.804	
		20	6	1.431	1.719	1.360	.638	
		21	5	3.456	4.511	3.475	1.561	
		22	4	9.812	11.330	12.145	5.083	
		23	3	21.779	20.753	29.007	14.081	
		24	2	5.985	6.647	8.729	4.903	
		25	1	0.000	0.000	0.000	0.000	
		Ave		3.607	3.988	2.712	6.072	
		σ		3.095	3.038	2.084	4.407	}i=6
		Cv		.858	.762	.768	.726	
		Ave		5.342	5.741	5.916	5.225	
		σ		5.870	5.641	7.795	4.665	}i=12
		Cv		1.099	.983	1.318	.893	

Ap-8-4 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1971	7	20	18	.459	.459	.940	1.967	
		21	17	.510	.490	.721	2.946	
		22	16	.791	.720	.605	5.870	
		23	15	.760	.643	.656	6.953	
		24	14	.695	.673	.763	6.504	
		25	13	.535	.610	1.101	1.607	
		26	12	.473	.441	.712	.825	
		27	11	.839	.677	.914	.982	
		28	10	.490	.421	.951	.871	◎
		29	9	.306	.276	.732	.520	
		30	8	.400	.381	.852	.942	
		31	7	.727	.720	1.239	2.205	
	8	1	6	1.693	1.723	2.901	3.973	
		2	5	4.639	4.711	8.898	9.260	
		3	4	9.100	9.022	18.136	14.873	
		4	3	6.384	6.543	13.057	10.280	
		5	2	2.526	2.762	4.766	4.056	
		6	1	0.000	0.000	0.000	0.000	
		Ave.		.582	.542	.849	2.683	
				.165	.143	.181	2.278	} i=12
		Cv		.284	.263	.213	.849	
		Ave		1.740	1.737	3.219	4.146	
				2.406	2.432	4.900	3.973	} i=18
		Cv		1.383	1.400	1.522	.958	

Ap-8-5 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1972	7	11	13	1.850	1.850	1.870	5.500	
		12	12	1.912	1.873	1.906	6.221	
		13	11	3.295	3.256	3.243	2.837	
		14	10	2.216	2.050	2.298	4.973	
		15	9	3.424	2.802	3.136	5.213	
		16	8	2.737	2.509	2.684	3.835	
		17	7	1.406	1.458	1.466	1.675	◎
		18	6	1.939	2.438	2.390	1.569	
		19	5	4.140	5.620	5.499	4.154	
		20	4	6.133	6.194	6.149	4.475	
		21	3	.830	.894	.856	.844	
		22	2	.052	.007	.003	.029	
		23	1	0.000	0.000	0.000	0.000	
		Ave		2.717	2.813	2.863	3.754	
		σ		1.416	1.585	1.550	1.701	} i=11
		Cv		.521	.564	.541	.458	
		Ave		2.303	2.381	2.423	3.179	
		σ		1.625	1.776	1.760	2.066	} i=13
		Cv		.706	.746	.726	.650	

Ap-B-6 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1972	7	23	22	2.558	2.495	2.495	3.401	
		24	21	2.357	2.313	2.220	2.445	
		25	20	2.211	2.193	1.991	1.880	
		26	19	2.059	2.031	1.734	1.553	
		27	18	2.608	2.485	2.493	2.175	◎
		28	17	2.552	2.452	2.440	2.080	
		29	16	1.957	1.920	1.612	1.986	
		30	15	1.457	1.450	1.254	3.055	
		31	14	1.495	1.499	1.398	3.329	
	8	1	13	1.565	1.576	1.506	3.328	
		2	12	1.700	1.719	1.664	3.474	
		3	11	2.673	2.699	3.101	5.140	
		4	10	2.801	2.890	2.555	3.934	
		5	9	3.350	3.453	2.842	3.245	
		6	8	5.861	5.974	6.936	6.507	
		7	7	10.769	10.815	18.953	15.504	
		8	6	9.739	10.095	17.523	13.197	
		9	5	.361	.663	.498	.272	
		10	4	.126	.089	1.337	.644	
		11	3	.120	.151	.685	.289	
		12	2	.353	.383	.088	.095	
		13	1	0.000	0.000	0.000	0.000	
		Ave		2.480	2.476	2.415	3.169	
		σ		1.044	1.078	1.323	1.270	}i=15
		Cv		0.421	0.435	0.548	0.401	
		Ave		2.667	2.698	3.423	3.524	
		σ		2.724	2.770	4.884	3.794	}i=22
		Cv		1.022	1.027	1.427	1.077	

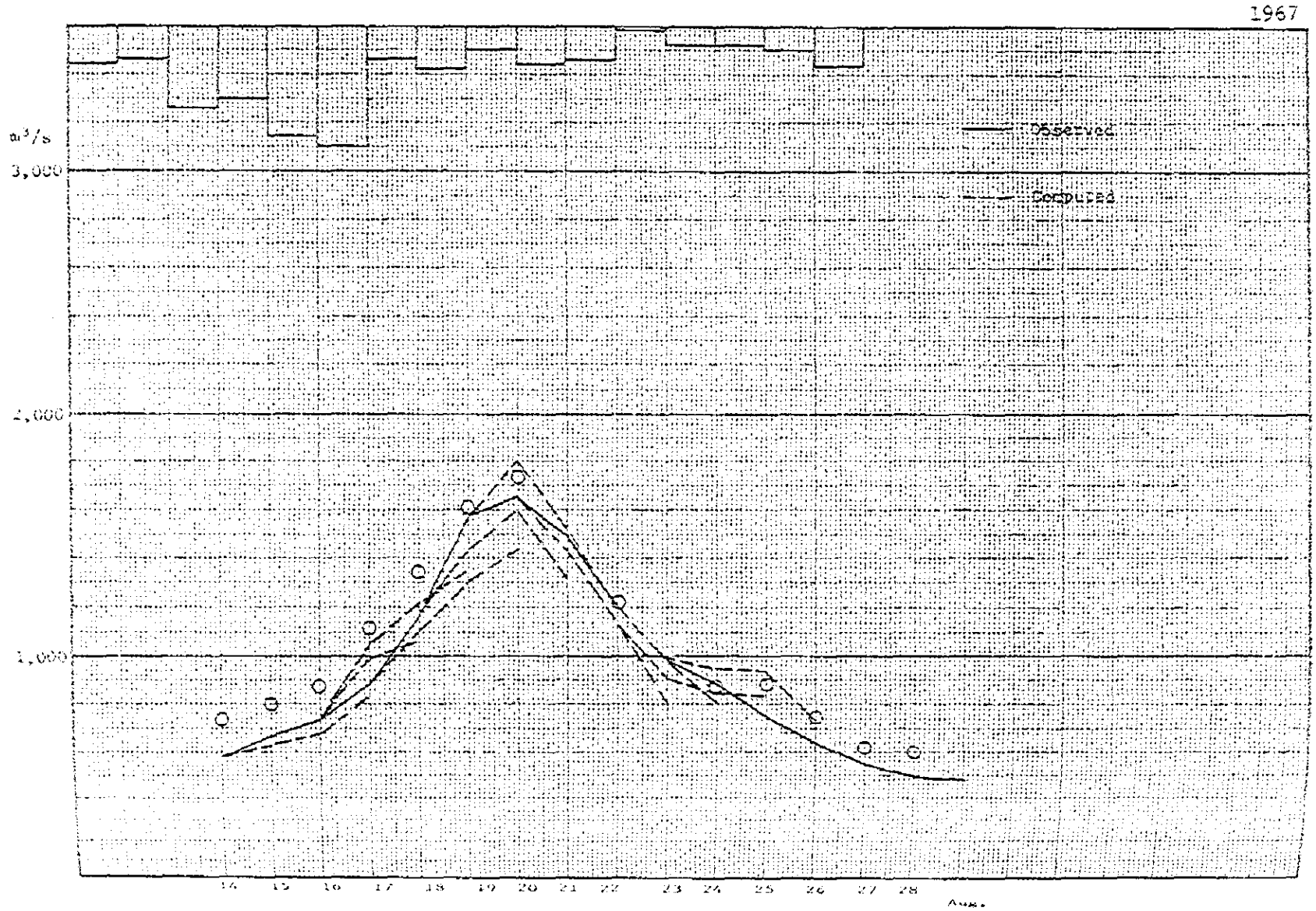
Ap-8-7 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1973	6	15	16	5.856	4.581	4.581	17.451	
		16	15	1.835	2.433	1.601	9.286	
		17	14	3.301	4.556	1.328	3.021	
		18	13	3.620	4.526	1.734	1.758	
		19	12	5.056	6.307	2.828	5.690	
		20	11	1.617	2.909	.683	1.885	◎
		21	10	1.745	2.676	.839	1.876	
		22	9	1.988	3.214	.940	2.017	
		23	8	3.561	5.153	2.514	4.446	
		24	7	3.191	4.326	2.578	4.758	
		25	6	1.532	2.307	1.224	4.151	
		26	5	.526	.909	.422	1.846	
		27	4	.026	.018	.042	.161	
		28	3	.024	.068	.017	.280	
		29	2	0.000	.002	.000	.001	
		30	1	0.000	0.000	0.000	0.000	
		Ave		3.127	3.900	1.817	5.373	
		σ		1.525	1.234	1.223	5.191	} i=8
		Cv		.488	.316	.673	.966	
		Ave		2.117	2.749	1.333	3.664	
		σ		1.778	2.006	1.239	4.293	} i=16
		Cv		.846	.730	.930	1.172	

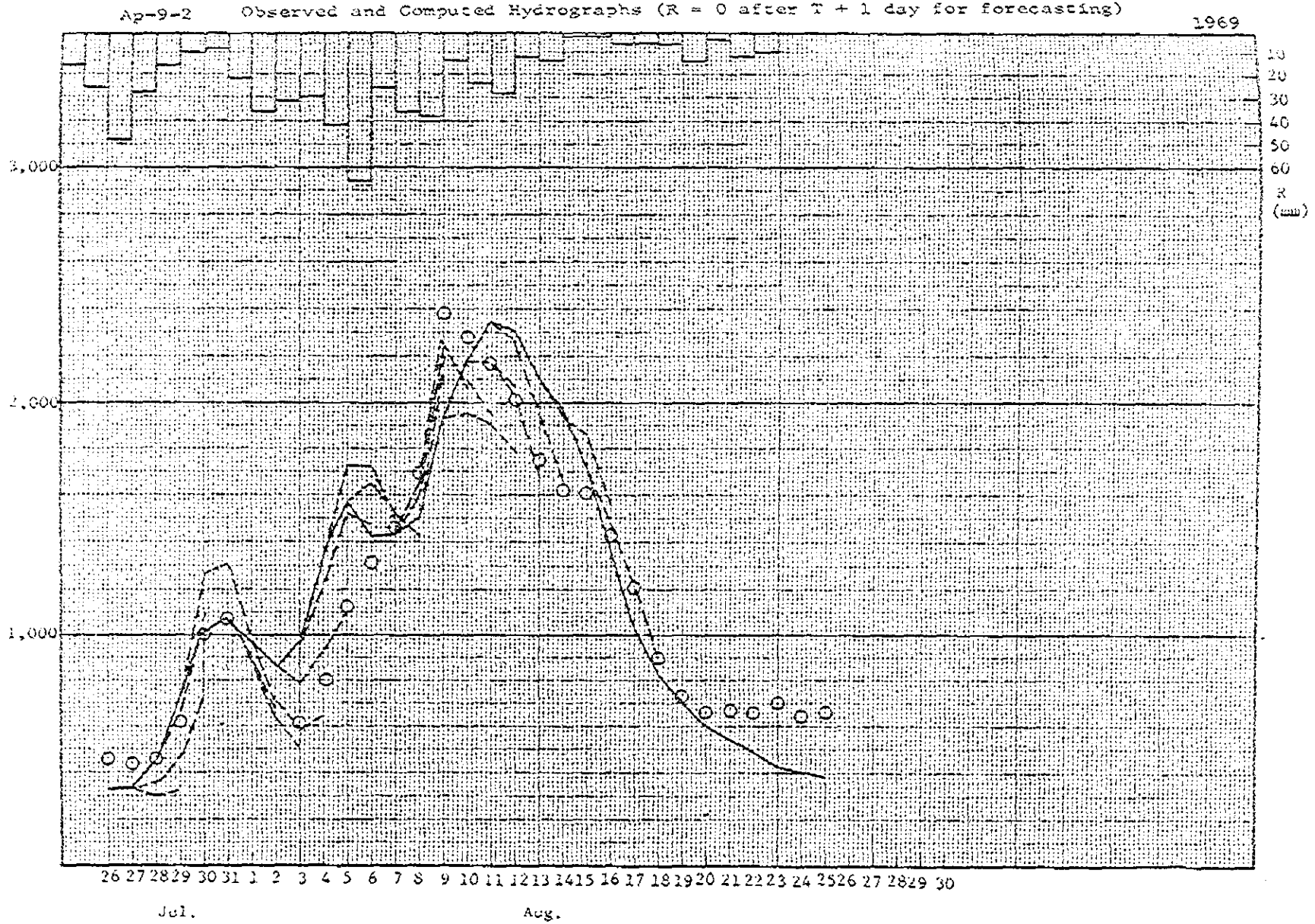
Ap-8-8 Error in Average Value Computation

Year	Month	Day	N	Case 1	Case 2	Case 3	Case 4	
1974	8	12	20	1.051	1.034	1.034	6.735	
		13	19	1.167	1.117	1.117	7.068	
		14	18	1.141	1.074	1.065	2.854	
		15	17	1.231	1.061	1.246	4.395	
		16	16	1.386	1.184	1.367	4.808	
		17	15	1.014	.943	1.144	3.478	
		18	14	1.011	.937	1.005	1.953	
		19	13	2.197	1.838	1.944	3.188	
		20	12	.905	.874	.986	1.081	
		21	11	.362	.442	.466	.575	◎
		22	10	.246	.669	.456	.875	
		23	9	.619	1.160	.891	1.469	
		24	8	.287	.536	.368	1.053	
		25	7	.278	.102	.090	.679	
		26	6	.775	.226	.229	1.151	
		27	5	.381	.140	.177	.805	
		28	4	.289	.170	.207	.332	
		29	3	.829	.496	.620	.181	
		30	2	.051	.053	.062	.017	
		31	1	0.000	0.000	0.000	0.000	
		Ave		.971	.990	1.007	3.041	
		σ		.505	.333	.404	2.099	
		Cv		.520	.337	.401	.690	
		Ave		.761	.703	.724	2.135	
		σ		.528	.483	.517	2.109	
		Cv		.694	.687	.714	.988	

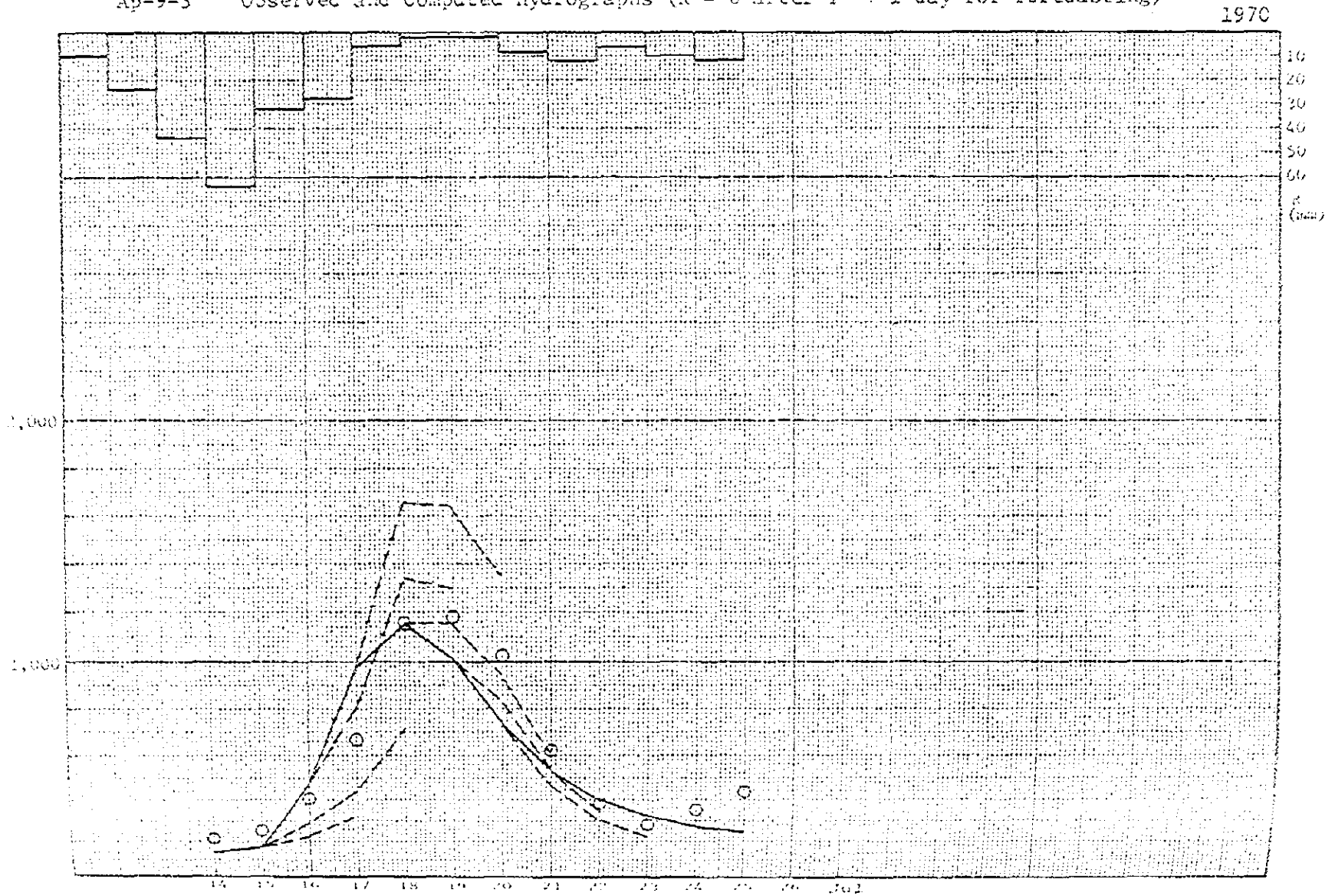
Ap-9-1 Observed and Computed Hydrographs (R = 0 after T + 1 day for forecasting)



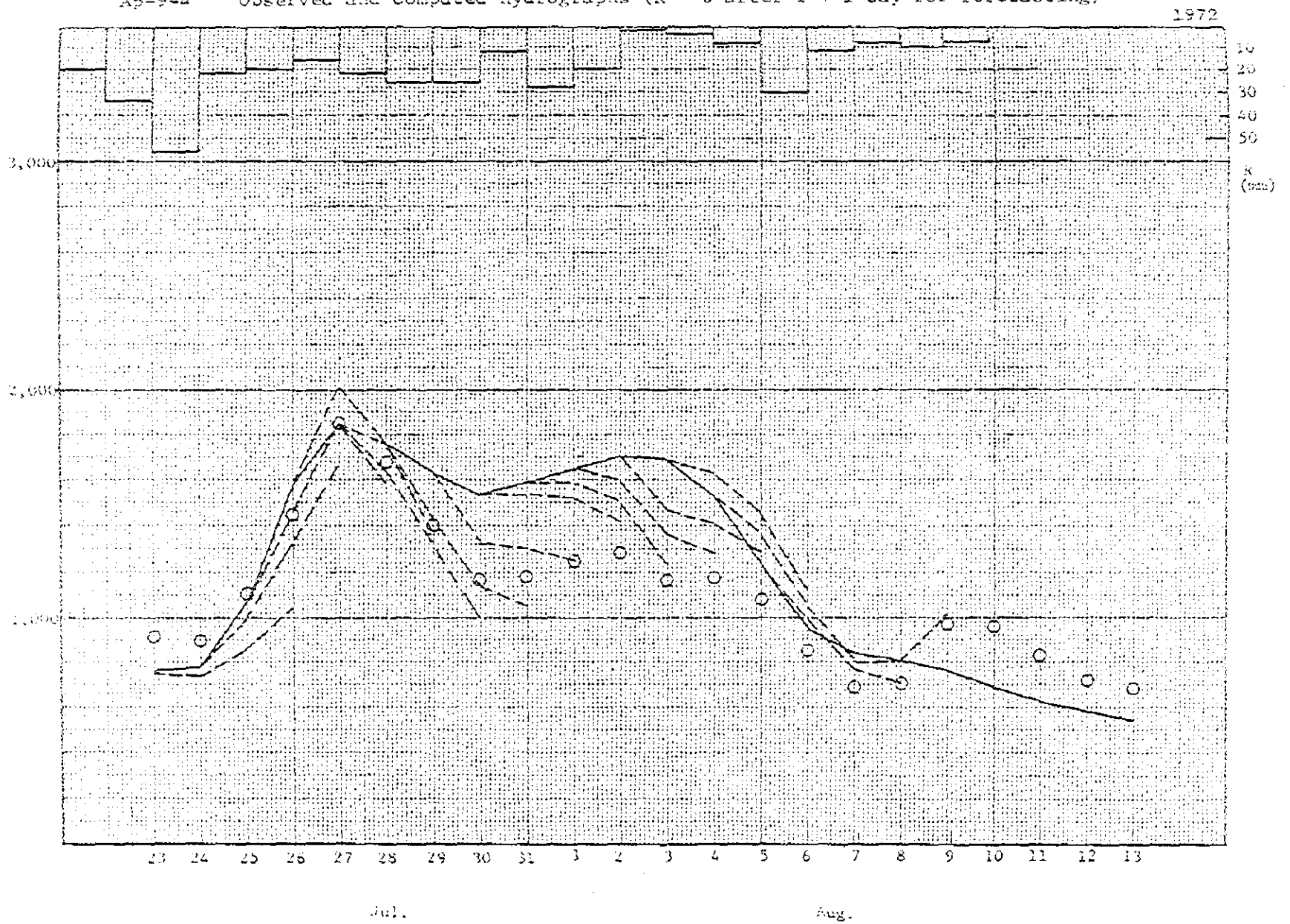
Ap-9-2 Observed and Computed Hydrographs (R = 0 after T + 1 day for forecasting)



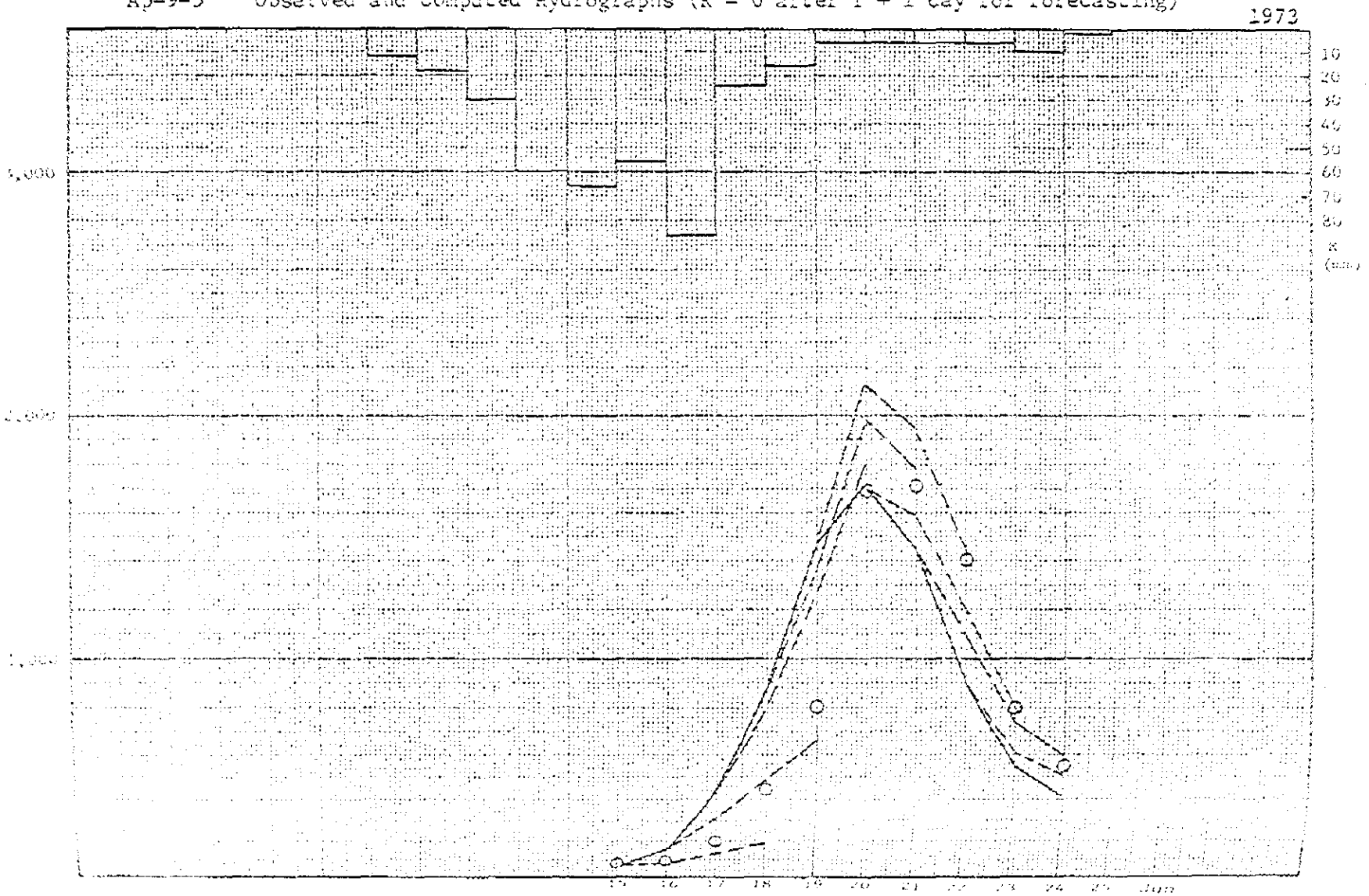
Ap-9-3 Observed and Computed Hydrographs (R = 0 after T + 1 day for forecasting)



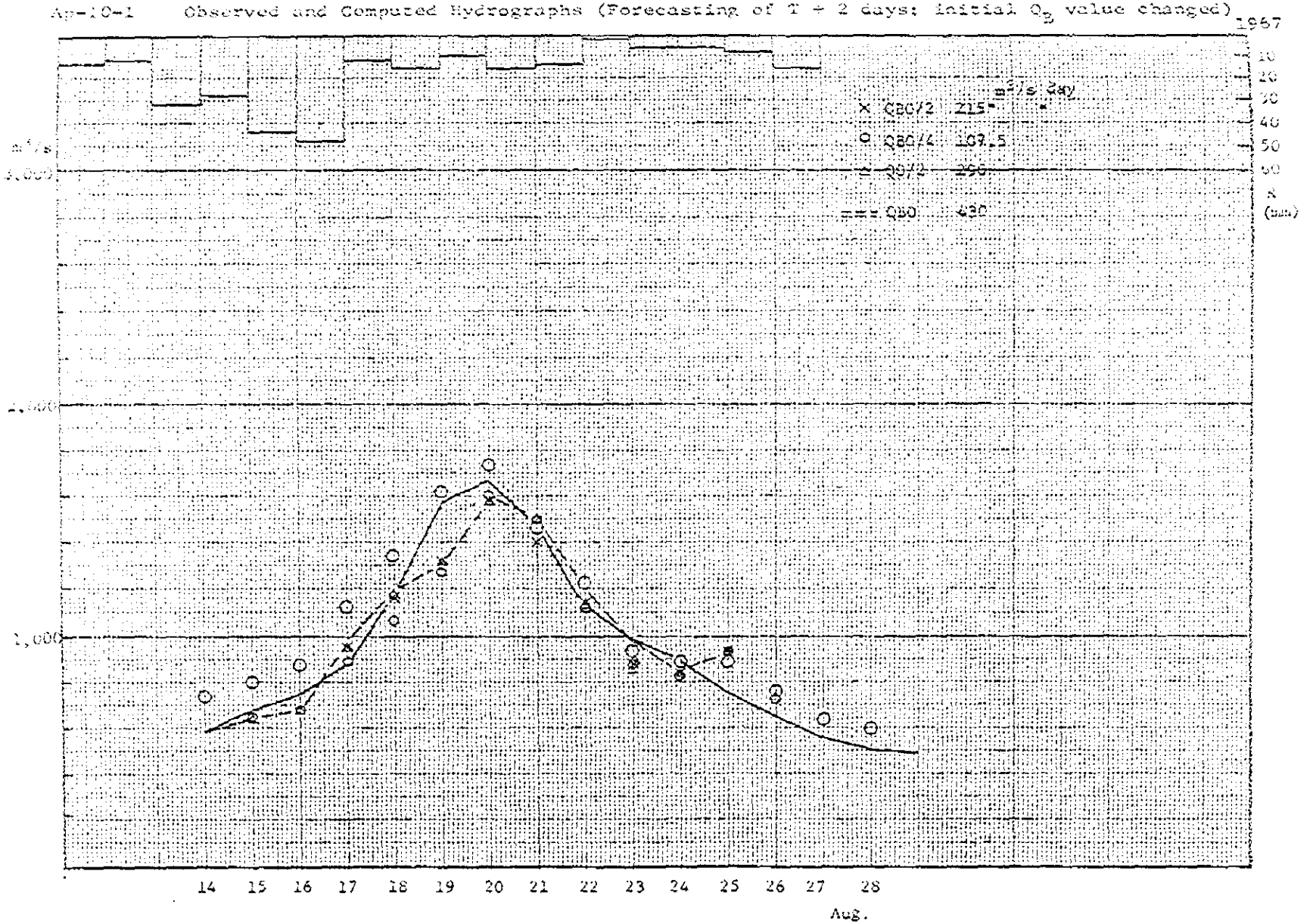
Ap-9-4 Observed and Computed Hydrographs (R = 0 after T + 1 day for forecasting)



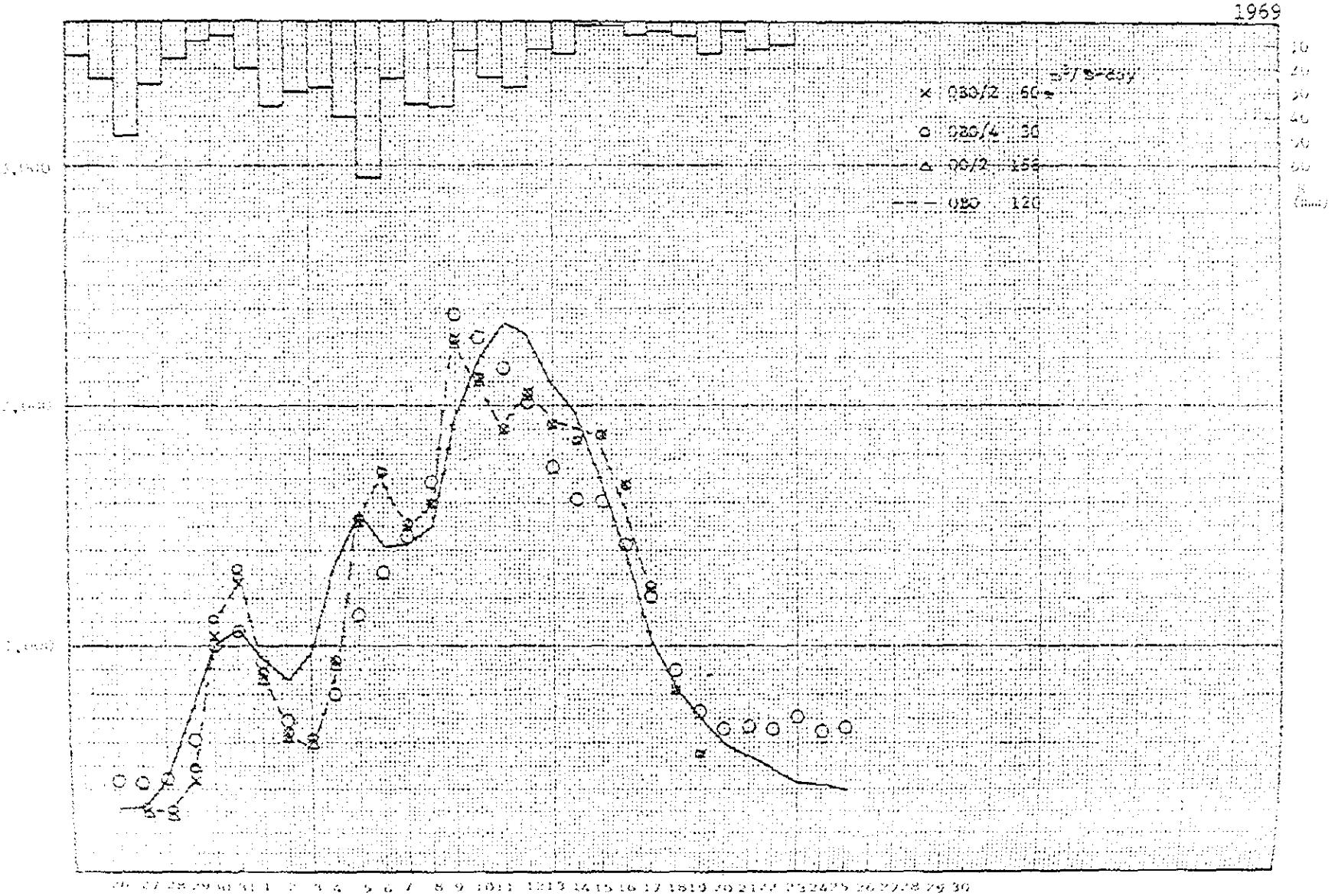
Ap-9-5 Observed and Computed Hydrographs (R = 0 after T + 1 day for forecasting)



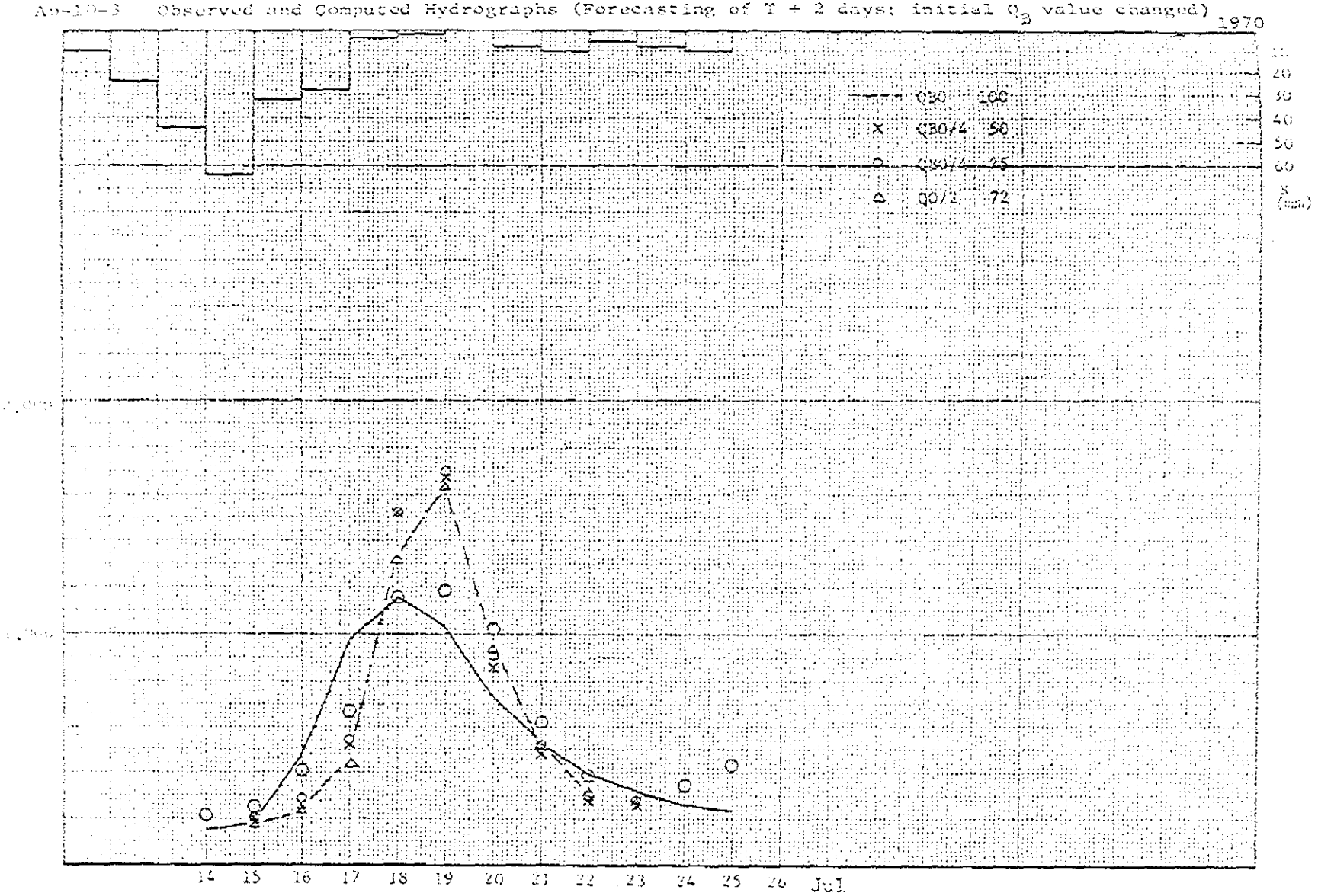
Ap-10-1 Observed and Computed Hydrographs (Forecasting of T + 2 days; Initial Q_0 value changed)



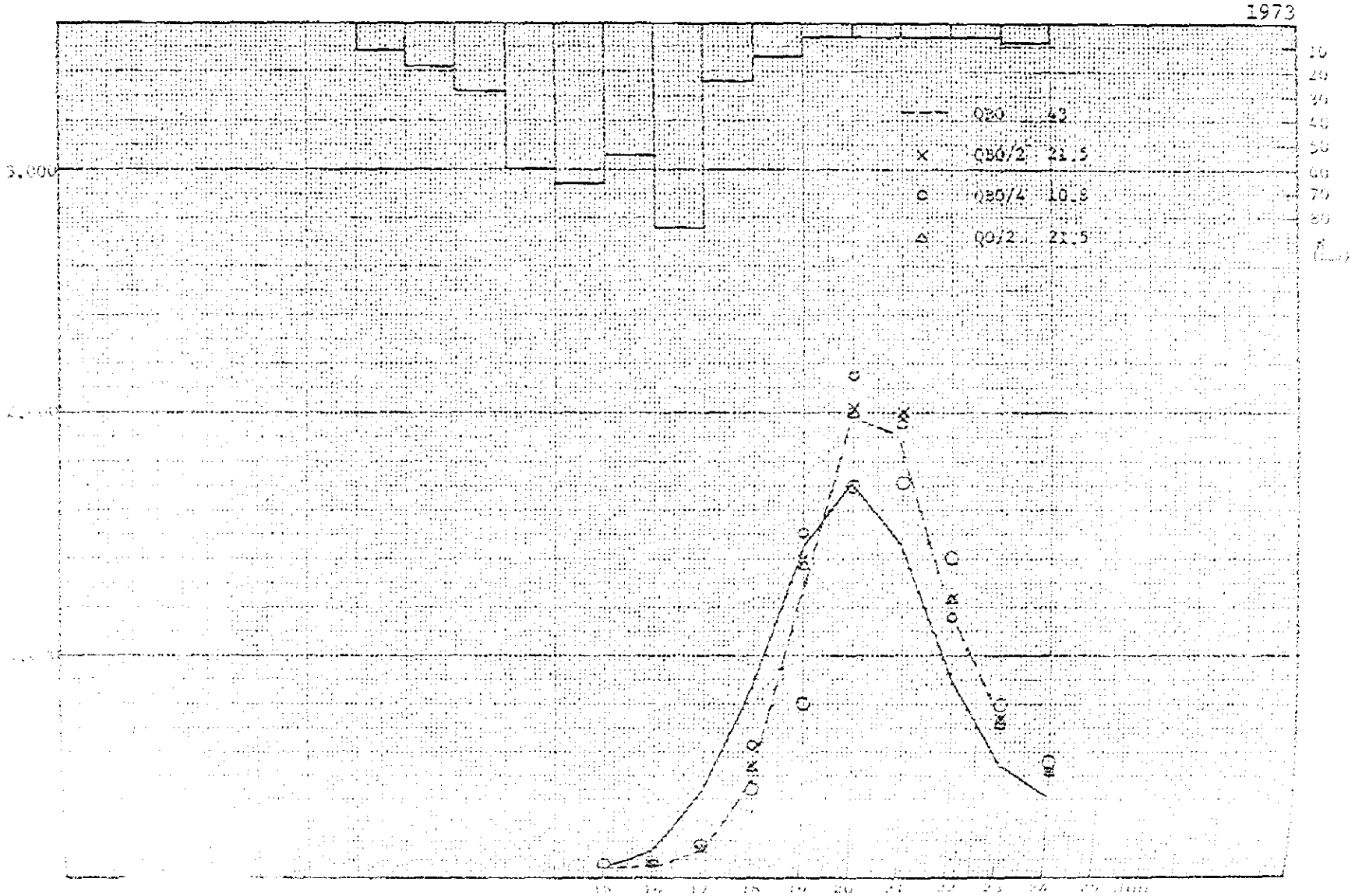
Ap-10-2 Observed and Computed Hydrographs (Forecasting of T + 2 days; initial Q_3 value changed)



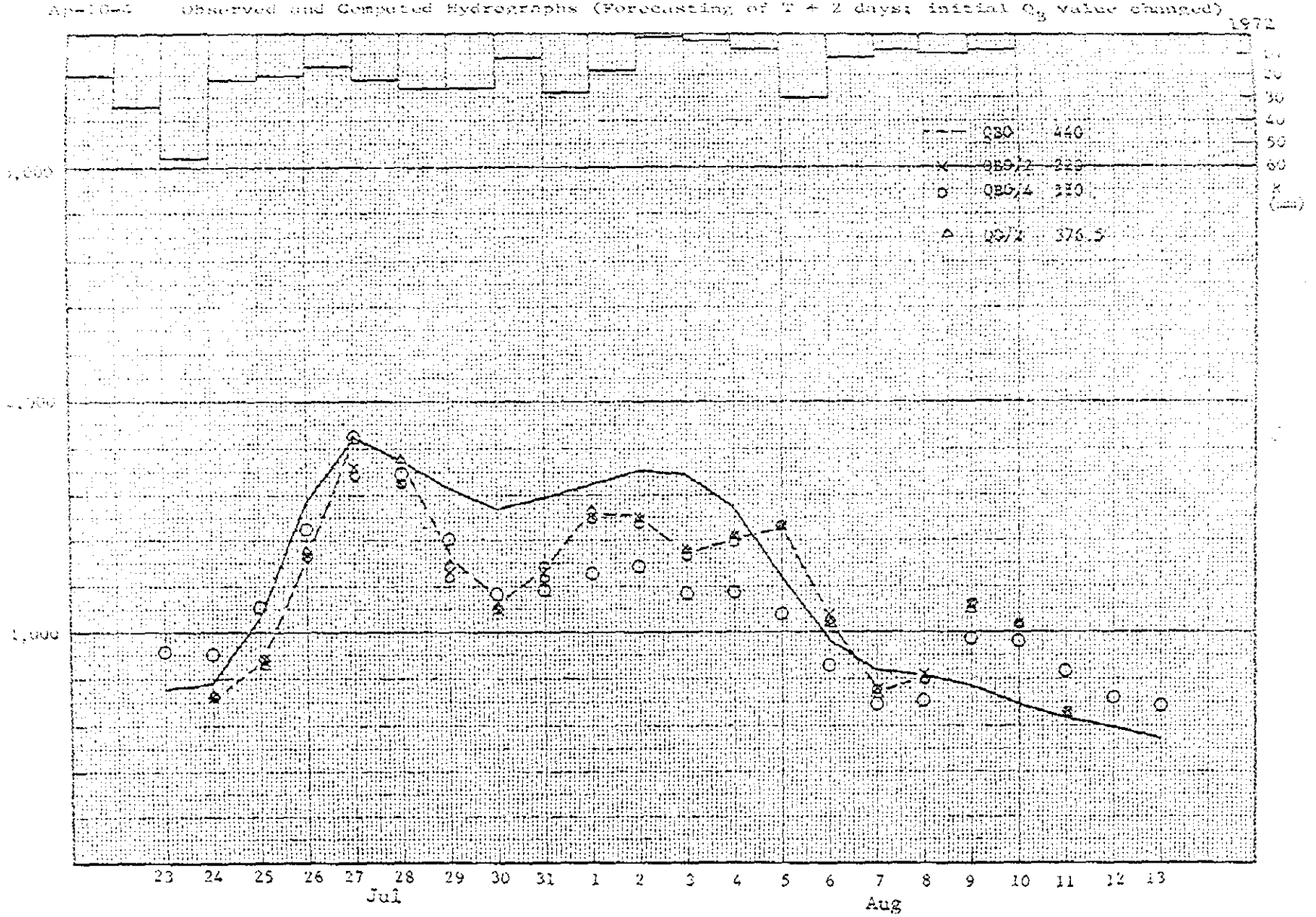
Ao-10-3 Observed and Computed Hydrographs (Forecasting of T + 2 days; initial Q_3 value changed)



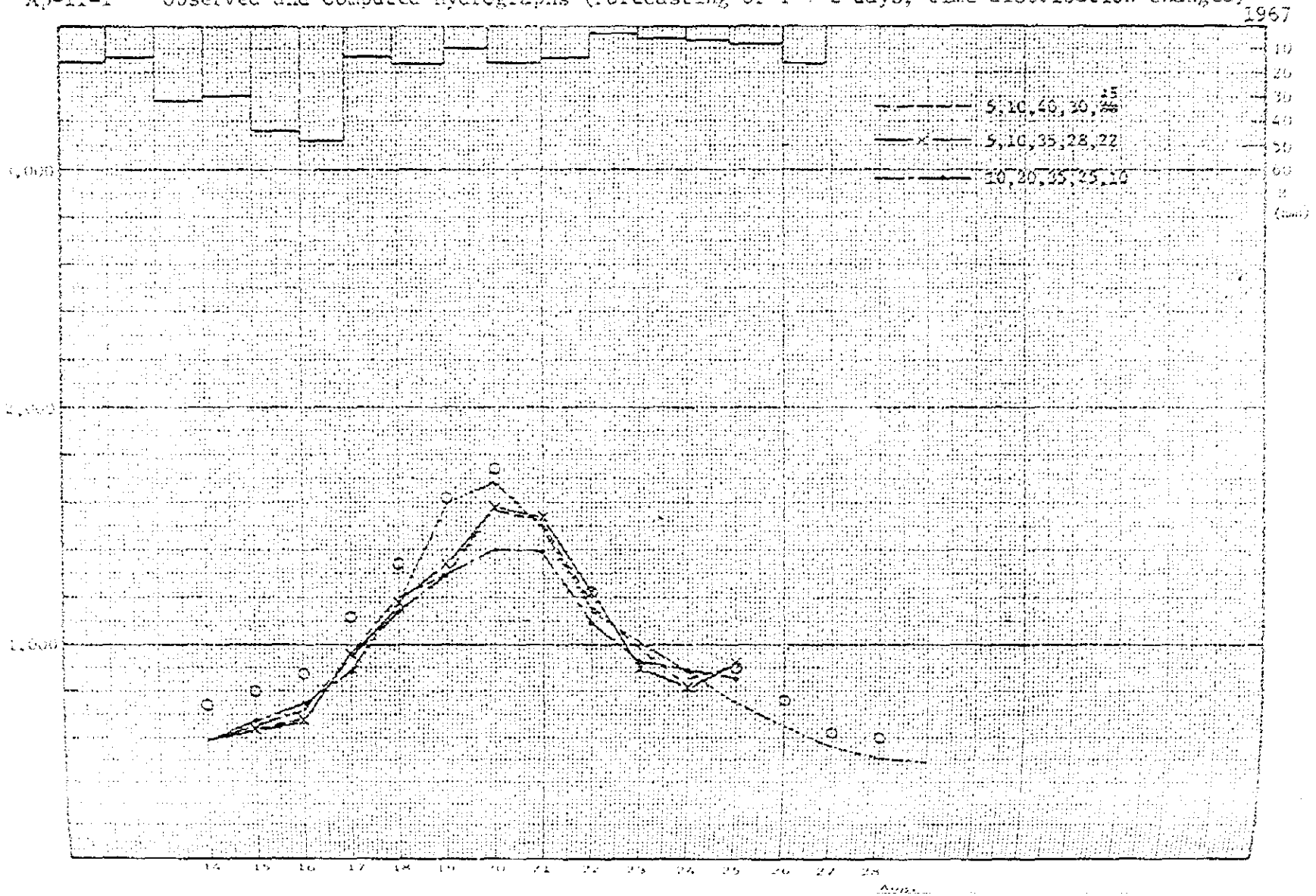
Ap-10-5 Observed and Computed Hydrographs (Forecasting of T + 2 days; initial Q_3 value changed)



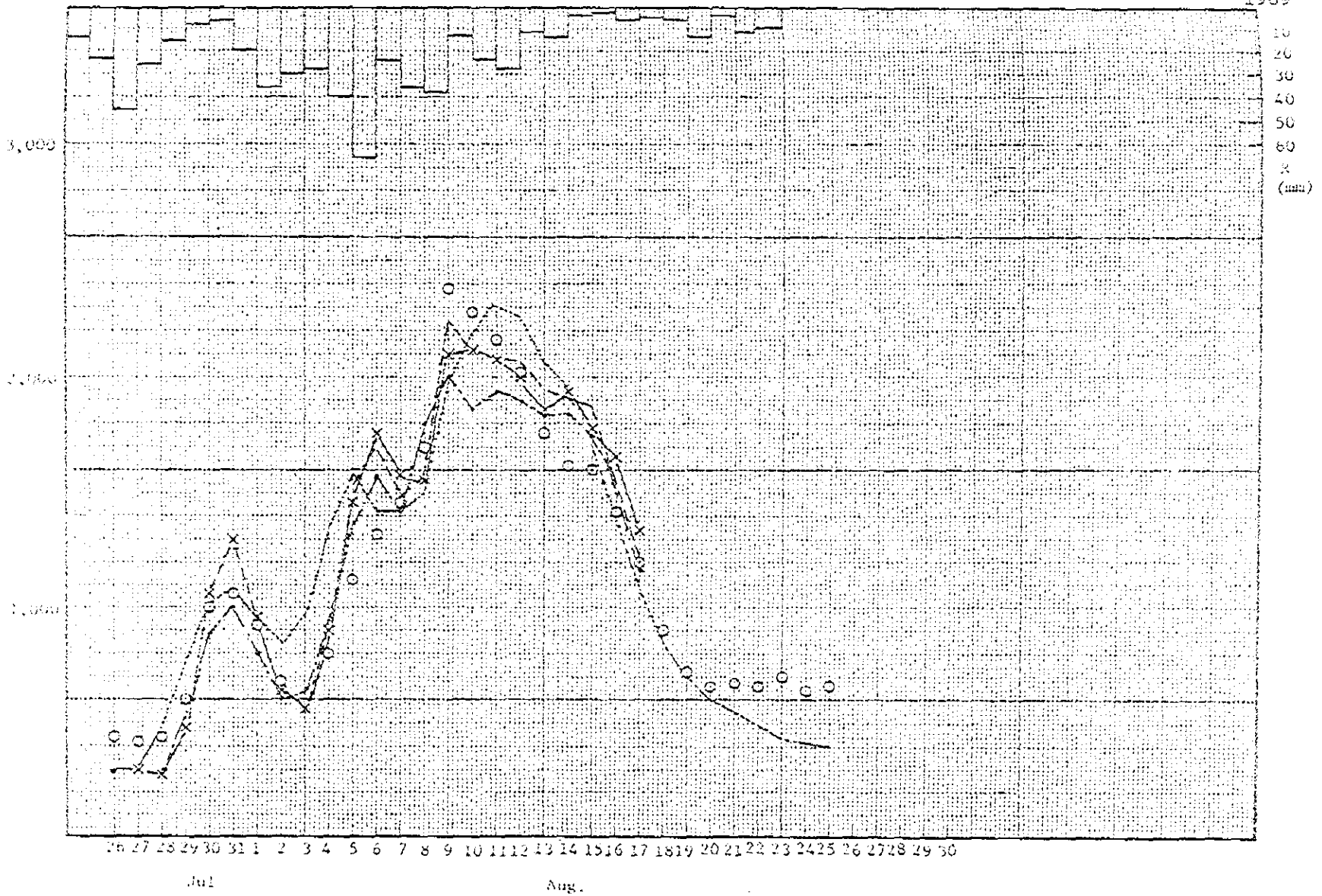
Appendix Observed and Computed Hydrographs (Forecasting of T + 2 days; initial Q_3 value changed)



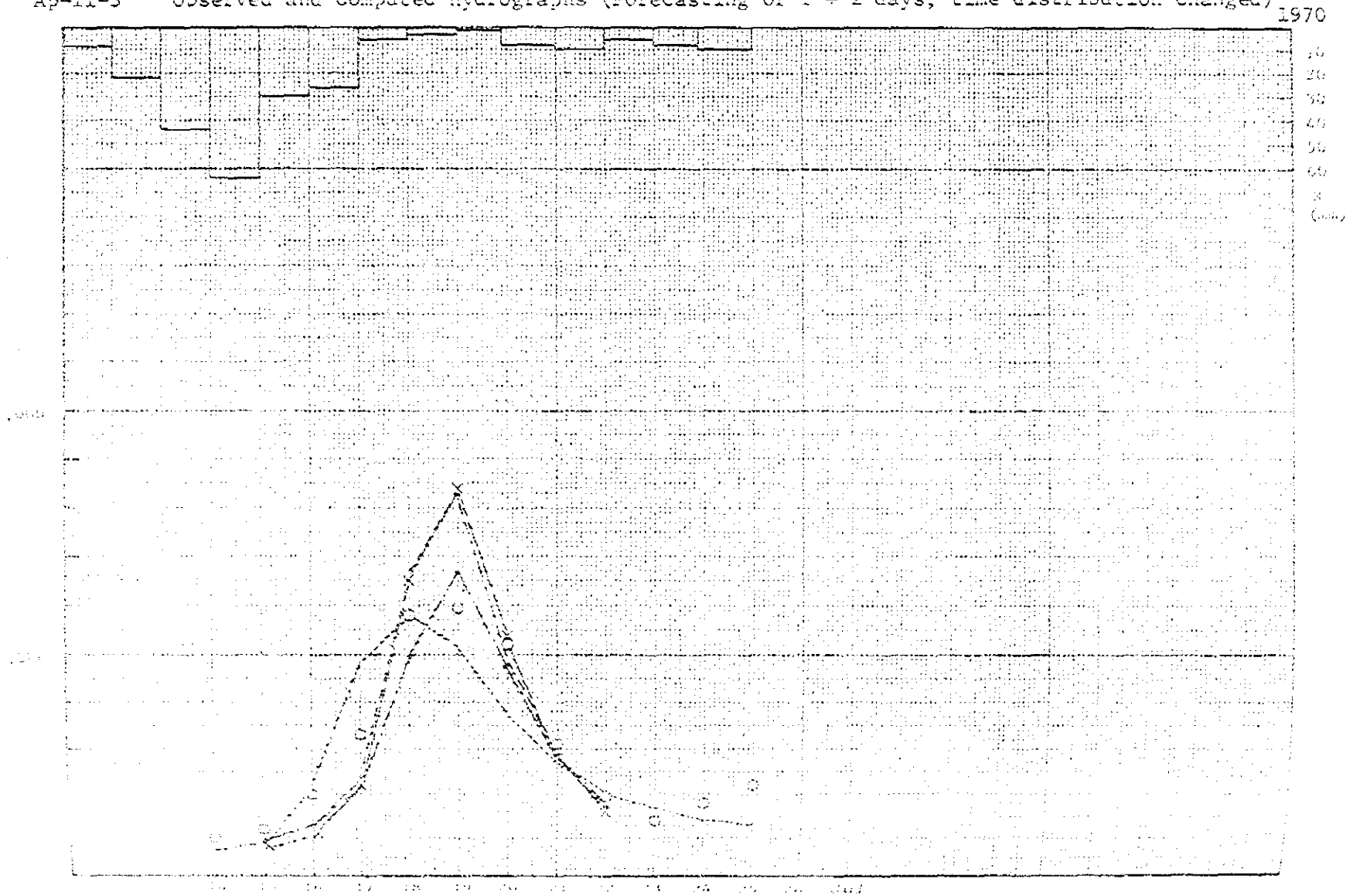
Ap-11-1 Observed and Computed Hydrographs (Forecasting of T + 2 days; time distribution changed)



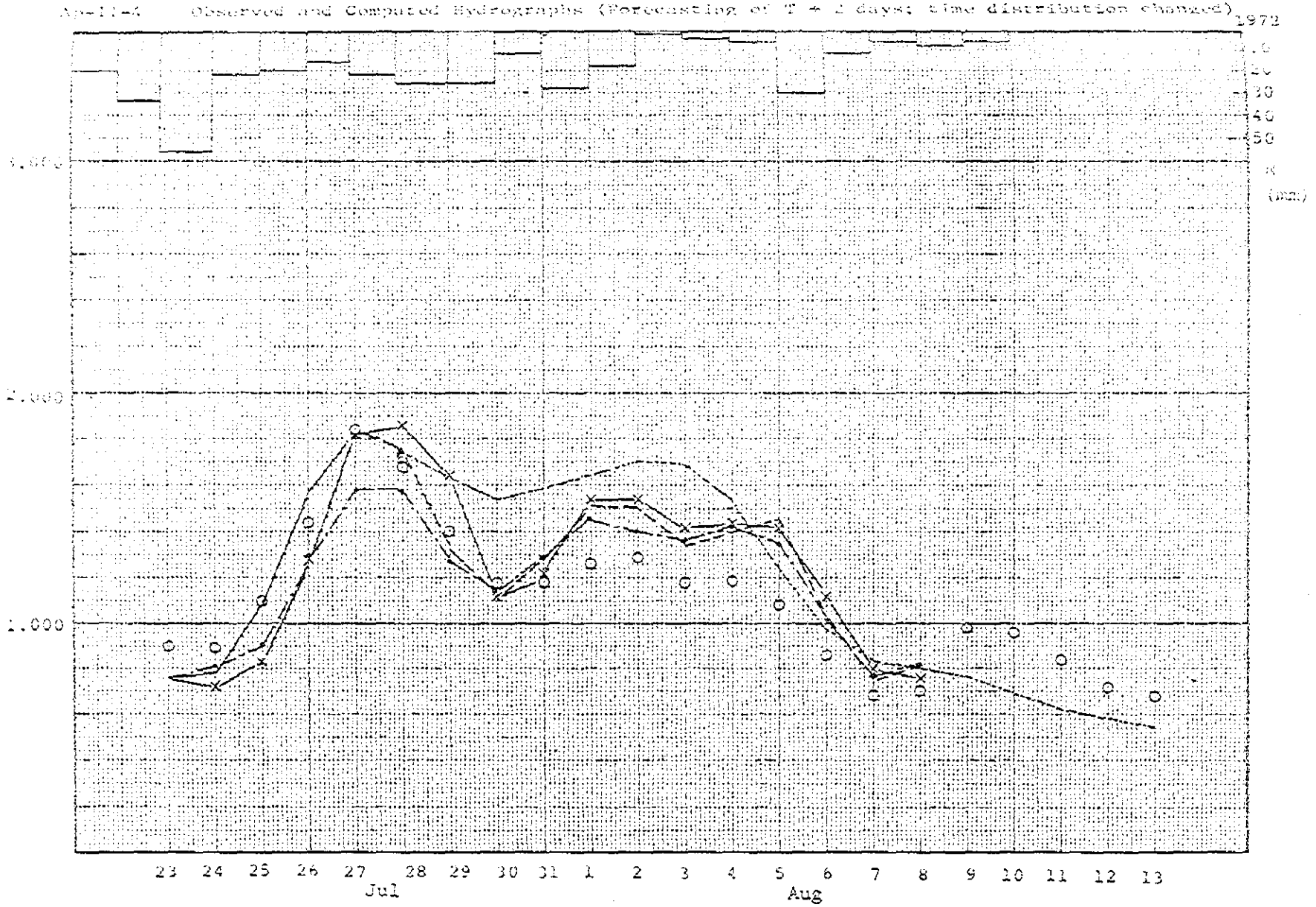
Ap-11-2 Observed and Computed Hydrographs (Forecasting of T + 2 days; time distribution changed) 1969



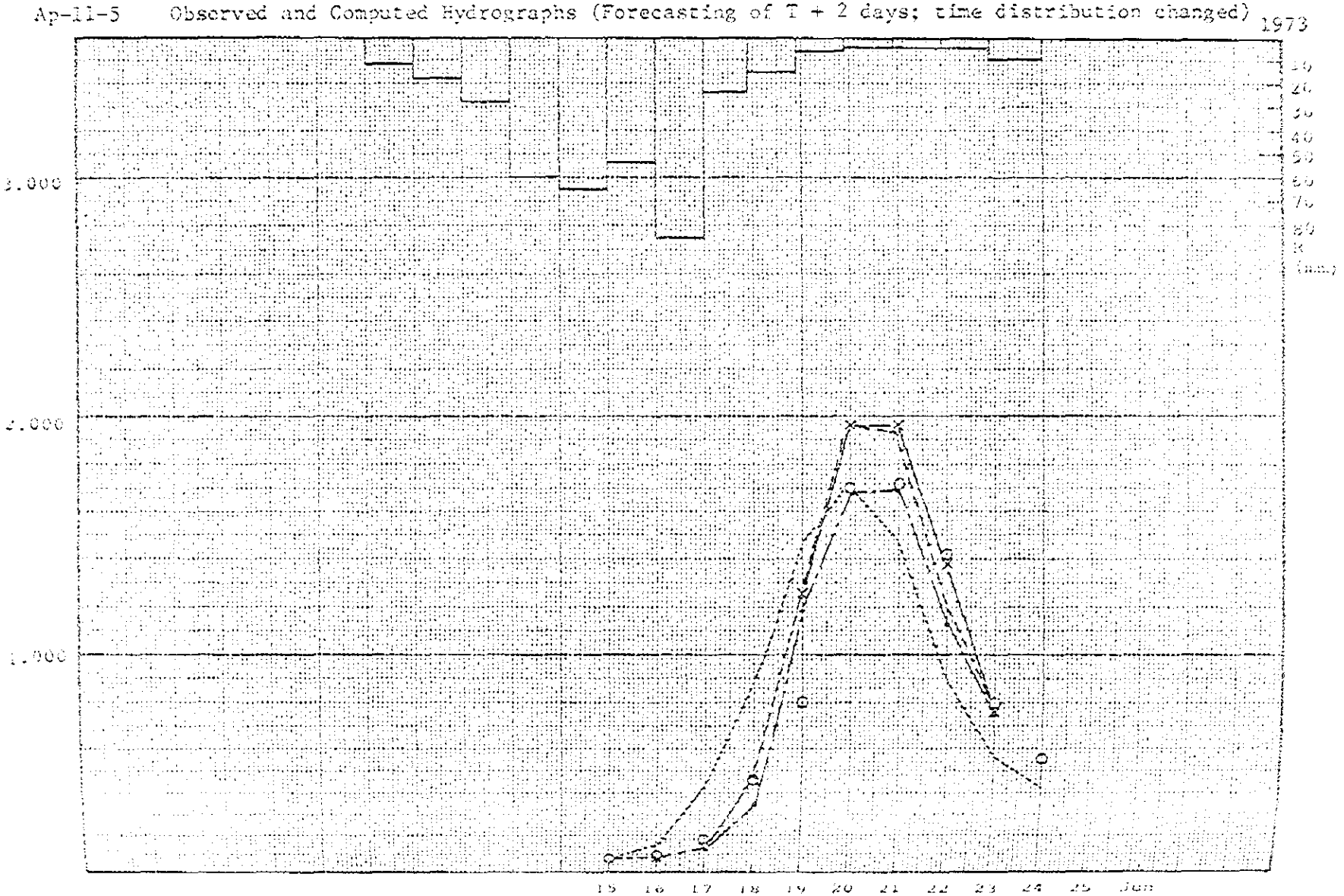
Ap-II-3 Observed and Computed Hydrographs (Forecasting of T + 2 days; time distribution changed)



Appl-4 Observed and Computed Hydrographs (Forecasting of T + 2 days; time distribution changed)



Ap-11-5 Observed and Computed Hydrographs (Forecasting of T + 2 days; time distribution changed)



*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 10 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
11	101.40	61.54	0.70	30.77	7.73	-16.30	145.51	-1.79	0.50	30.77	321.15	260.49	406.00	406.00
12	83.90	65.43	1.00	25.81	18.46	-10.79	148.89	-1.84	0.61	39.62	536.43	435.11	584.00	584.00
13	63.80	49.76	1.00	19.63	33.45	-24.57	244.40	-3.01	0.61	30.13	1414.85	1147.60	1392.00	1392.00
14	34.30	33.25	1.00	13.12	25.74	-37.54	310.20	-3.82	0.61	20.13	2259.62	1832.80	2143.00	2143.00
15	15.10	15.10	1.00	5.14	17.36	-56.93	367.49	-4.53	0.66	9.96	2837.49	2301.51	2669.00	2669.00
** 16	13.00	13.00	1.00	4.42	12.03	-63.12	473.36	-5.84	0.66	8.58	3106.41	2519.64	2993.00	2993.00
17	10.60	10.60	1.00	3.61	6.52	-63.31	513.22	-6.33	0.66	6.99	2445.98	1983.96	2497.17	3026.00
18	13.90	13.90	1.00	4.73	4.32	-61.29	514.51	-6.34	0.66	9.17	1575.08	1277.56	1792.07	2723.00
19	8.60	8.60	1.00	2.93	4.11	-59.22	501.11	-6.18	0.66	5.67	1059.61	859.46	1360.57	2171.00
20	8.80	6.16	0.70	2.10	3.97	-57.17	487.74	-6.01	0.66	4.06	806.42	654.09	1141.84	1538.00
21	7.90	5.53	0.70	1.88	3.04	-54.36	474.87	-5.85	0.66	3.65	782.21	634.46	1109.33	1068.00
22	20.20	14.14	0.70	4.81	2.20	-50.91	457.72	-5.64	0.66	9.33	665.75	539.99	997.72	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	437.59	-5.39	0.0	0.0	553.38	448.85	886.44	753.00

YEAR 1972 MONTH 7 *** CASE 10 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	@I (MM)	B.P. (CMSD)	@B (MM)	-@B (MM)	BETA	RS (MM)	@S (MM)	@S (CMSD)	@C (CMSD)	@O (CMSD)
12	83.90	79.29	1.00	31.28	18.46	10.79	148.89	-1.84	0.61	48.01	536.43	435.11	584.00	584.00
13	63.80	60.29	1.00	23.78	33.45	24.57	244.40	-3.01	0.61	36.51	1414.85	1147.60	1392.00	1392.00
14	34.30	34.30	1.00	9.90	25.74	37.54	310.20	-3.82	0.71	24.40	2259.62	1832.80	2143.00	2143.00
15	15.10	15.10	1.00	3.03	17.36	56.93	367.49	-4.53	0.80	12.07	2837.49	2301.51	2669.00	2669.00
16	13.00	13.00	1.00	2.61	12.03	86.28	473.36	-5.84	0.80	10.39	3106.41	2519.64	2993.00	2993.00
17	10.60	10.60	1.00	2.13	4.28	82.90	621.90	-7.67	0.80	8.47	2963.96	2404.10	3026.00	3026.00
18	13.90	13.90	1.00	2.79	2.55	77.97	605.83	-7.47	0.80	11.11	1908.63	1548.11	2153.94	2723.00
19	8.60	8.60	1.00	1.73	2.42	73.21	583.24	-7.19	0.80	6.87	1284.01	1041.47	1624.71	2171.00
20	8.80	6.16	0.70	1.24	2.34	68.61	562.15	-6.93	0.80	4.92	977.19	792.61	1354.76	1538.00
21	7.90	5.53	0.70	1.11	1.79	63.72	542.56	-6.69	0.80	4.42	947.86	768.82	1311.37	1068.00
22	20.20	14.14	0.70	2.84	1.30	58.63	517.23	-6.38	0.80	11.30	806.73	654.35	1171.58	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	484.03	-5.97	0.0	0.0	670.57	543.90	1027.93	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 10 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	S.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
13	63.80	63.80	1.00	17.65	33.45	24.57	244.40	-3.01	0.61	46.15	1414.85	1147.60	1392.00	1392.00
14	34.30	34.30	1.00	3.46	25.74	37.54	310.20	-3.82	0.71	30.84	2259.62	1832.80	2143.00	2143.00
15	15.10	15.10	1.00	0.0	17.36	56.93	367.49	-4.53	1.00	15.10	2837.49	2301.51	2669.00	2669.00
16	13.00	13.00	1.00	0.0	12.03	86.28	473.36	-5.84	1.00	13.00	3106.41	2519.64	2993.00	2993.00
17	10.60	10.60	1.00	0.0	4.28	113.25	621.90	-7.67	1.00	10.60	2963.96	2404.10	3026.00	3026.00
** 18	13.90	13.90	1.00	0.0	0.0	103.81	765.89	-9.44	1.00	13.90	2404.60	1950.40	2716.28	2723.00
19	8.60	8.60	1.00	0.0	0.0	95.03	712.02	-8.78	1.00	8.60	1611.15	1306.82	2018.84	2171.00
20	8.80	6.16	0.70	0.0	0.0	86.83	665.35	-8.20	1.00	6.16	1222.50	991.58	1656.93	1538.00
21	7.90	5.53	0.70	0.0	0.0	79.13	624.51	-7.70	1.00	5.53	1185.80	961.81	1586.32	1068.00
22	20.20	14.14	0.70	0.0	0.0	71.87	588.45	-7.25	1.00	14.14	1009.25	818.61	1407.07	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	556.39	-6.86	0.0	0.0	838.90	680.44	1236.83	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 10 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	@I (MM)	S.P. (MM)	@B (CMSD)	-@B (MM)	BETA	RS (MM)	@S (MM)	@S (CMSD)	@C (CMSD)	@O (CMSD)
14	34.30	34.30	1.00	1.13	25.74	37.54	310.20	-3.82	0.71	33.17	2259.62	1832.80	2143.00	2143.00
15	15.10	15.10	1.00	0.0	17.36	56.93	367.49	-4.53	1.00	15.10	2837.49	2301.51	2669.00	2669.00
16	13.00	13.00	1.00	0.0	12.03	86.28	473.36	-5.84	1.00	13.00	3106.41	2519.64	2993.00	2993.00
17	10.60	10.60	1.00	0.0	4.28	113.25	621.90	-7.67	1.00	10.60	2963.96	2404.10	3026.00	3026.00
18	13.90	13.90	1.00	0.0	0.0	113.22	765.89	-9.44	1.00	13.90	2404.60	1950.40	2716.28	2723.00
19	8.60	8.60	1.00	0.0	0.0	103.78	765.69	-9.44	1.00	8.60	1646.02	1335.10	2100.79	2171.00
20	8.80	6.16	0.70	0.0	0.0	95.00	711.85	-8.78	1.00	6.16	1222.50	991.58	1703.43	1538.00
21	7.90	5.53	0.70	0.0	0.0	86.80	665.20	-8.20	1.00	5.53	1185.80	961.81	1627.01	1068.00
22	20.20	14.14	0.70	0.0	0.0	79.10	624.37	-7.70	1.00	14.14	1009.25	818.61	1442.99	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	588.34	-7.25	0.0	0.0	838.90	680.44	1268.78	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 10 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
15	15.10	13.63	1.00	0.0	17.36	56.93	367.49	-4.53	1.00	13.63	2837.49	2301.51	2669.00	2669.00
16	13.00	11.74	1.00	0.0	12.03	86.28	473.36	-5.84	1.00	11.74	3106.41	2519.64	2993.00	2993.00
17	10.60	9.57	1.00	0.0	4.28	113.25	621.90	-7.67	1.00	9.57	2963.96	2404.10	3026.00	3026.00
18	13.90	12.55	1.00	0.0	0.0	113.22	765.89	-9.44	1.00	12.55	2404.60	1950.40	2716.28	2723.00
19	8.60	7.76	1.00	0.0	0.0	90.55	765.69	-9.44	1.00	7.76	1646.02	1335.10	2100.79	2171.00
** 20	8.80	6.16	0.70	0.0	0.0	82.62	642.72	-7.92	1.00	6.16	1103.78	895.28	1538.00	1538.00
21	7.90	5.53	0.70	0.0	0.0	75.17	604.56	-7.45	1.00	5.53	1073.63	870.83	1475.40	1068.00
22	20.20	14.14	0.70	0.0	0.0	68.13	570.75	-7.04	1.00	14.14	919.90	746.14	1316.89	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	540.56	-6.66	0.0	0.0	793.59	643.69	1184.25	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 10 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
16	13.00	6.50	1.00	0.0	12.03	86.28	473.36	-5.84	1.00	8.50	3106.41	2519.64	2993.00	2993.00
17	10.60	6.93	1.00	0.0	4.28	113.25	621.90	-7.67	1.00	6.93	2963.96	2404.10	3026.00	3026.00
18	13.90	9.08	1.00	0.0	0.0	113.22	765.89	-9.44	1.00	9.08	2404.60	1950.40	2716.28	2723.00
19	8.60	5.62	1.00	0.0	0.0	90.55	765.69	-9.44	1.00	5.62	1646.02	1335.10	2100.79	2171.00
20	8.80	4.46	0.70	0.0	0.0	50.92	642.72	-7.92	1.00	4.46	1103.78	895.28	1538.00	1538.00
21	7.90	5.53	0.70	0.0	0.0	45.52	437.63	-5.40	1.00	5.53	777.17	630.37	1068.00	1068.00
22	20.20	14.14	0.70	0.0	0.0	40.49	407.85	-5.03	1.00	14.14	673.53	546.31	954.16	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	381.93	-4.71	0.0	0.0	609.25	494.17	876.10	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 20 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	S.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
11	101.40	90.43	0.70	61.68	7.73	-16.30	145.51	-1.79	0.37	28.76	321.15	260.49	406.00	406.00
12	83.90	83.90	1.00	46.87	21.62	13.38	148.89	-1.84	0.42	37.03	536.43	435.11	584.00	584.00
13	63.80	63.80	1.00	35.64	37.33	30.62	256.25	-3.16	0.44	28.16	1400.24	1135.75	1392.00	1392.00
14	34.30	34.30	1.00	16.97	42.50	56.43	335.71	-4.14	0.51	17.33	2228.17	1807.29	2143.00	2143.00
15	15.10	15.10	1.00	6.27	33.87	92.41	470.28	-5.80	0.58	8.83	2710.76	2198.72	2669.00	2669.00
** 16	13.00	13.00	1.00	5.40	17.49	101.87	652.05	-8.04	0.58	7.60	2886.11	2340.95	2993.00	2993.00
17	10.60	10.60	1.00	4.40	8.15	101.37	701.44	-8.65	0.58	6.20	2219.85	1800.54	2501.98	3026.00
18	13.90	13.90	1.00	5.77	5.27	98.03	698.74	-8.61	0.58	8.13	1402.54	1137.61	1836.35	2723.00
19	8.60	8.60	1.00	3.57	5.01	94.65	680.94	-8.40	0.58	5.03	931.51	755.56	1436.50	2171.00
20	8.80	6.16	0.70	2.56	4.84	91.31	663.39	-8.18	0.58	3.60	714.77	579.76	1243.14	1538.00
21	7.90	5.53	0.70	2.30	3.71	87.04	646.49	-7.97	0.58	3.23	693.31	562.35	1208.84	1068.00
22	20.20	14.14	0.70	5.87	2.68	82.01	625.56	-7.71	0.58	8.27	590.09	478.62	1104.18	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	0.0	601.72	-7.42	0.0	0.0	490.49	397.84	999.56	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 20 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	ΣI (MM)	B.P. (MM)	ΣB (CMSD)	-ΣB (MM)	BETA	RS (MM)	ΣS (MM)	ΣS (CMSD)	ΣC (CMSD)	ΣO (CMSD)
12	83.90	83.90	1.00	39.11	21.62	13.38	148.89	-1.84	0.42	44.79	536.43	435.11	584.00	584.00
13	63.80	63.80	1.00	29.74	37.33	30.62	256.25	-3.16	0.44	34.06	1400.24	1135.75	1392.00	1392.00
14	34.30	34.30	1.00	13.34	42.50	56.43	335.71	-4.14	0.61	20.96	2228.17	1807.29	2143.00	2143.00
15	15.10	15.10	1.00	4.42	33.87	92.41	470.28	-5.80	0.71	10.68	2710.76	2198.72	2669.00	2669.00
16	13.00	13.00	1.00	3.81	17.49	126.49	652.05	-8.04	0.71	9.19	2886.11	2340.95	2993.00	2993.00
** 17	10.60	10.60	1.00	3.10	6.02	122.05	848.35	-10.46	0.71	7.50	2684.78	2177.65	3026.00	3026.00
18	13.90	13.90	1.00	4.07	3.72	115.66	819.76	-10.11	0.71	9.83	1696.28	1375.87	2195.63	2723.00
19	8.60	8.60	1.00	2.52	3.53	109.58	780.30	-9.62	0.71	6.08	1126.61	913.80	1694.10	2171.00
20	8.80	6.16	0.70	1.80	3.41	103.81	744.48	-9.18	0.71	4.36	864.47	701.18	1445.66	1538.00
21	7.90	5.53	0.70	1.62	2.61	97.65	712.05	-8.78	0.71	3.91	838.52	680.13	1392.18	1068.00
22	20.20	14.14	0.70	4.14	1.89	91.17	678.94	-8.37	0.71	10.00	713.68	578.87	1257.81	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	645.81	-7.96	0.0	0.0	593.21	481.16	1126.97	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 20 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	S.P. (MM)	QB (CMSD)	-QS (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
13	63.80	63.80	1.00	21.56	37.33	30.62	256.25	-3.16	0.44	42.24	1400.24	1135.75	1392.00	1392.00
14	34.30	34.30	1.00	8.30	42.50	56.43	335.71	-4.14	0.61	26.00	2228.17	1807.29	2143.00	2143.00
15	15.10	15.10	1.00	1.86	33.87	92.41	470.28	-5.80	0.88	13.24	2710.76	2198.72	2669.00	2669.00
16	13.00	13.00	1.00	1.60	17.49	126.49	652.05	-8.04	0.88	11.40	2886.11	2340.95	2993.00	2993.00
17	10.60	10.60	1.00	1.30	6.02	149.92	848.35	-10.46	0.88	9.30	2684.78	2177.65	3026.00	3026.00
18	13.90	13.90	1.00	1.71	1.56	138.95	1016.65	-12.53	0.88	12.19	2103.71	1706.34	2723.00	2723.00
19	8.60	8.60	1.00	1.06	1.48	128.92	934.05	-11.52	0.88	7.54	1397.21	1133.29	2067.34	2171.00
20	8.80	6.16	0.70	0.76	1.43	119.70	864.43	-10.66	0.88	5.40	1072.11	869.60	1734.02	1538.00
21	7.90	5.53	0.70	0.68	1.10	110.87	804.99	-9.92	0.88	4.85	1039.92	843.49	1648.48	1068.00
22	20.20	14.14	0.70	1.74	0.79	102.40	751.94	-9.27	0.88	12.40	885.09	717.91	1469.85	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	704.30	-8.68	0.0	0.0	735.70	596.73	1301.03	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 20 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	@I (MM)	B.P. (MM)	@B (CMSD)	-@B (MM)	BETA	RS (MM)	@S (MM)	@S (CMSD)	@C (CMSD)	@O (CMSD)
14	34.30	34.30	1.00	7.00	42.50	56.43	335.71	-4.14	0.61	27.30	2228.17	1807.29	2143.00	2143.00
15	15.10	15.10	1.00	1.19	33.87	92.41	470.28	-5.80	0.88	13.91	2710.76	2198.72	2669.00	2669.00
16	13.00	13.00	1.00	1.03	17.49	126.49	652.05	-8.04	0.92	11.97	2886.11	2340.95	2993.00	2993.00
17	10.60	10.60	1.00	0.64	6.02	149.92	848.35	-10.46	0.92	9.76	2684.78	2177.65	3026.00	3026.00
18	13.90	13.90	1.00	1.10	1.56	145.29	1016.65	-12.53	0.92	12.80	2103.71	1706.34	2723.00	2723.00
** 19	8.60	8.60	1.00	0.68	0.95	134.15	980.89	-12.09	0.92	7.92	1467.26	1190.11	2171.00	2171.00
20	8.80	6.16	0.70	0.49	0.92	123.97	900.03	-11.10	0.92	5.67	1125.86	913.20	1813.23	1538.00
21	7.90	5.53	0.70	0.44	0.71	114.42	832.01	-10.26	0.92	5.09	1092.07	885.79	1717.80	1068.00
22	20.20	14.14	0.70	1.12	0.51	105.40	772.84	-9.53	0.92	13.02	929.47	753.90	1526.74	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	720.85	-8.89	0.0	0.0	772.59	626.65	1347.50	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 20 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
15	15.10	15.10	1.00	3.30	33.87	92.41	470.28	-5.80	0.88	11.80	2710.76	2198.72	2669.00	2669.00
16	13.00	13.00	1.00	2.84	17.49	126.49	652.05	-8.04	0.92	10.16	2886.11	2340.95	2993.00	2993.00
17	10.60	10.60	1.00	2.32	6.02	149.92	848.35	-10.46	0.78	8.28	2684.78	2177.65	3026.00	3026.00
18	13.90	13.90	1.00	3.04	1.56	145.29	1016.65	-12.53	0.78	10.86	2103.71	1706.34	2723.00	2723.00
19	8.60	8.60	1.00	1.88	0.95	112.83	980.89	-12.09	0.78	6.72	1467.26	1190.11	2171.00	2171.00
20	8.80	6.16	0.70	1.35	2.55	105.97	763.42	-9.41	0.78	4.81	954.97	774.58	1538.00	1538.00
21	7.90	5.53	0.70	1.21	1.95	99.00	724.01	-8.93	0.78	4.32	926.30	751.33	1475.34	1068.00
22	20.20	14.14	0.70	3.09	1.41	91.95	686.05	-8.46	0.78	11.05	788.39	639.47	1325.52	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	649.72	-8.01	0.0	0.0	655.32	531.53	1181.26	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 20 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
16	13.00	13.00	1.00	5.65	17.49	126.49	652.05	-8.04	0.92	7.35	2886.11	2340.95	2993.00	2993.00
17	10.60	10.60	1.00	4.61	6.02	149.92	848.35	-10.46	0.78	5.99	2684.78	2177.65	3026.00	3026.00
18	13.90	13.90	1.00	6.04	1.56	145.29	1016.65	-12.53	0.57	7.86	2103.71	1706.34	2723.00	2723.00
19	8.60	8.60	1.00	3.74	0.95	112.83	980.89	-12.09	0.57	4.86	1467.26	1190.11	2171.00	2171.00
20	8.80	6.16	0.70	2.68	2.55	64.73	763.42	-9.41	0.57	3.48	954.97	774.58	1538.00	1538.00
21	7.90	5.53	0.70	2.40	3.88	62.14	524.11	-6.46	0.57	3.13	670.55	543.89	1068.00	1068.00
22	20.20	14.14	0.70	6.14	2.81	58.70	506.73	-6.25	0.57	8.00	570.71	462.91	969.64	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	484.46	-5.97	0.0	0.0	474.38	384.78	869.24	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 30 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
11	101.40	70.98	0.70	40.48	5.27	-18.15	145.51	-1.79	0.46	30.50	321.15	260.49	406.00	406.00
12	83.90	83.90	1.00	45.07	18.41	8.85	143.95	-1.77	0.43	38.83	542.53	440.05	584.00	584.00
13	63.80	63.80	1.00	36.38	27.51	18.97	235.88	-2.91	0.43	27.42	1425.35	1156.12	1392.00	1392.00
14	34.30	34.30	1.00	16.57	39.39	44.43	283.83	-3.50	0.52	17.73	2292.13	1859.17	2143.00	2143.00
15	15.10	15.10	1.00	6.15	34.10	83.21	402.07	-4.96	0.59	8.95	2794.85	2266.93	2669.00	2669.00
** 16	13.00	13.00	1.00	5.30	17.41	93.13	607.32	-7.49	0.59	7.70	2941.25	2385.68	2993.00	2993.00
17	10.60	10.60	1.00	4.32	7.98	93.03	655.67	-8.08	0.59	6.28	2242.34	1818.79	2474.45	3026.00
18	13.90	13.90	1.00	5.66	5.17	90.12	655.14	-8.08	0.59	8.24	1409.59	1143.33	1798.47	2723.00
19	8.60	8.60	1.00	3.50	4.92	87.14	640.61	-7.90	0.59	5.10	946.53	767.74	1408.35	2171.00
20	8.80	6.16	0.70	2.51	4.75	84.17	626.04	-7.72	0.59	3.65	724.36	587.54	1213.58	1538.00
21	7.90	5.53	0.70	2.25	3.64	80.27	611.84	-7.54	0.59	3.28	702.62	569.90	1181.74	1068.00
22	20.20	14.14	0.70	5.76	2.63	75.58	593.66	-7.32	0.59	8.38	598.01	485.05	1078.71	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	572.55	-7.06	0.0	0.0	497.07	403.18	975.73	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 30 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
12	83.90	83.90	1.00	36.41	18.41	8.85	143.95	-1.77	0.43	47.49	542.53	440.05	584.00	584.00
13	63.80	63.80	1.00	30.27	27.51	18.97	235.88	-2.91	0.43	33.53	1425.35	1156.12	1392.00	1392.00
14	34.30	34.30	1.00	12.61	39.39	44.43	283.83	-3.50	0.63	21.69	2292.13	1859.17	2143.00	2143.00
15	15.10	15.10	1.00	4.16	34.10	83.21	402.07	-4.96	0.72	10.94	2794.85	2266.93	2669.00	2669.00
16	13.00	13.00	1.00	3.56	17.41	119.19	607.32	-7.49	0.72	9.42	2941.25	2385.68	2993.00	2993.00
** 17	10.60	10.60	1.00	2.92	5.68	114.98	801.81	-9.89	0.72	7.68	2742.15	2224.19	3026.00	3026.00
18	13.90	13.90	1.00	3.83	3.50	108.90	776.16	-9.57	0.72	10.07	1723.78	1398.18	2174.34	2723.00
19	8.60	8.60	1.00	2.37	3.32	103.10	740.61	-9.13	0.72	6.23	1157.51	938.86	1679.47	2171.00
20	8.80	6.16	0.70	1.70	3.21	97.58	708.13	-8.73	0.72	4.46	885.82	718.50	1426.62	1538.00
21	7.90	5.53	0.70	1.52	2.46	91.67	678.56	-8.37	0.72	4.01	859.23	696.93	1375.49	1068.00
22	20.20	14.14	0.70	3.89	1.78	85.46	648.30	-7.99	0.72	10.25	731.30	593.16	1241.47	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	617.93	-7.62	0.0	0.0	607.86	493.04	1110.97	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 30 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (CMSD)	Q8 (MM)	-Q8	BETA	RS (MM)	QS (CMSD)	QS (CMSD)	QC (CMSD)	QO (CMSD)
13	63.80	63.80	1.00	21.81	27.51	18.97	235.88	-2.91	0.43	41.99	1425.35	1156.12	1392.00	1392.00
14	34.30	34.30	1.00	7.14	39.39	44.43	283.83	-3.50	0.63	27.16	2292.13	1859.17	2143.00	2143.00
15	15.10	15.10	1.00	1.40	34.10	83.21	402.07	-4.96	0.91	13.70	2794.85	2266.93	2669.00	2669.00
16	13.00	13.00	1.00	1.20	17.41	119.19	607.32	-7.49	0.91	11.80	2941.25	2385.68	2993.00	2993.00
17	10.60	10.60	1.00	0.98	5.68	144.11	801.81	-9.89	0.91	9.62	2742.15	2224.19	3026.00	3026.00
18	13.90	13.90	1.00	1.29	1.18	133.30	972.02	-11.98	0.91	12.61	2158.75	1750.98	2723.00	2723.00
19	8.60	8.60	1.00	0.80	1.12	123.40	894.17	-11.02	0.91	7.80	1449.59	1175.77	2069.95	2171.00
20	8.80	6.16	0.70	0.57	1.08	114.26	828.31	-10.21	0.91	5.59	1109.34	899.80	1728.11	1538.00
21	7.90	5.53	0.70	0.51	0.83	105.57	771.89	-9.52	0.91	5.02	1076.04	872.78	1644.68	1068.00
22	20.20	14.14	0.70	1.31	0.60	97.27	721.79	-8.90	0.91	12.83	915.83	742.84	1464.63	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	676.97	-8.35	0.0	0.0	761.25	617.46	1294.42	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 30 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
14	34.30	34.30	1.00	5.81	39.39	44.43	283.83	-3.50	0.63	28.49	2292.13	1859.17	2143.00	2143.00
15	15.10	15.10	1.00	0.73	34.10	83.21	402.07	-4.96	0.91	14.37	2794.85	2266.93	2669.00	2669.00
16	13.00	13.00	1.00	0.63	17.41	119.19	607.32	-7.49	0.95	12.37	2941.25	2385.68	2993.00	2993.00
17	10.60	10.60	1.00	0.51	5.68	144.11	801.81	-9.89	0.95	10.09	2742.15	2224.19	3026.00	3026.00
18	13.90	13.90	1.00	0.67	1.18	139.47	972.02	-11.98	0.95	13.23	2158.75	1750.98	2723.00	2723.00
** 19	8.60	8.60	1.00	0.42	0.58	128.49	937.82	-11.56	0.95	8.18	1520.35	1233.17	2171.00	2171.00
20	8.80	6.16	0.70	0.30	0.56	118.43	861.58	-10.62	0.95	5.86	1163.50	943.73	1805.30	1538.00
21	7.90	5.53	0.70	0.27	0.43	109.04	797.17	-9.83	0.95	5.26	1128.57	915.39	1712.57	1068.00
22	20.20	14.14	0.70	0.68	0.31	100.21	741.37	-9.14	0.95	13.46	960.54	779.10	1520.47	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	692.50	-8.54	0.0	0.0	798.41	647.60	1340.10	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 30 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (CMSD)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
15	15.10	15.10	1.00	2.86	34.10	83.21	402.07	-4.96	0.91	12.24	2794.85	2266.93	2669.00	2669.00
16	13.00	13.00	1.00	2.46	17.41	119.19	607.32	-7.49	0.95	10.54	2941.25	2385.68	2993.00	2993.00
17	10.60	10.60	1.00	2.01	5.68	144.11	801.81	-9.89	0.81	8.59	2742.15	2224.19	3026.00	3026.00
18	13.90	13.90	1.00	2.63	1.18	139.47	972.02	-11.98	0.81	11.27	2158.75	1750.98	2723.00	2723.00
19	8.60	8.60	1.00	1.63	0.58	107.75	937.82	-11.56	0.81	6.97	1520.35	1233.17	2171.00	2171.00
20	8.80	6.16	0.70	1.17	2.20	100.90	734.01	-9.05	0.81	4.99	991.22	803.99	1538.00	1538.00
21	7.90	5.53	0.70	1.05	1.69	94.01	696.21	-8.58	0.81	4.48	961.47	779.86	1476.07	1068.00
22	20.20	14.14	0.70	2.68	1.22	87.09	660.11	-8.14	0.81	11.46	818.32	663.75	1323.85	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	625.77	-7.72	0.0	0.0	680.19	551.71	1177.49	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 30 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
16	13.00	13.00	1.00	5.37	17.41	119.19	607.32	-7.49	0.95	7.63	2941.25	2385.68	2993.00	2993.00
17	10.60	10.60	1.00	4.38	5.68	144.11	801.81	-9.89	0.81	6.22	2742.15	2224.19	3026.00	3026.00
18	13.90	13.90	1.00	5.75	1.18	139.47	972.02	-11.98	0.59	8.15	2158.75	1750.98	2723.00	2723.00
19	8.60	8.60	1.00	3.55	0.58	107.75	937.82	-11.56	0.59	5.05	1520.35	1233.17	2171.00	2171.00
20	8.80	6.16	0.70	2.55	2.20	61.69	734.01	-9.05	0.59	3.61	991.22	803.99	1538.00	1538.00
** 21	7.90	5.53	0.70	2.29	3.69	59.17	503.74	-6.21	0.59	3.24	695.67	564.26	1068.00	1068.00
22	20.20	14.14	0.70	5.84	2.67	55.83	487.43	-6.01	0.59	8.30	592.09	480.25	967.68	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	466.63	-5.75	0.0	0.0	492.15	399.19	865.81	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 40 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
11	101.40	74.92	0.64	37.46	7.73	-14.62	145.51	-1.79	0.50	37.46	321.15	260.49	406.00	406.00
12	83.90	66.13	0.69	33.06	17.69	15.33	153.54	-1.89	0.50	33.06	530.70	430.46	584.00	584.00
13	63.80	53.61	0.84	24.12	32.71	33.25	265.56	-3.27	0.55	29.48	1388.76	1126.44	1392.00	1392.00
14	34.30	27.07	0.79	12.18	27.07	57.33	347.45	-4.28	0.55	14.89	2213.69	1795.55	2143.00	2143.00
15	15.10	12.17	0.81	5.48	19.66	87.59	475.85	-5.87	0.55	6.69	2703.88	2193.14	2669.00	2669.00
16	13.00	10.55	0.81	4.75	12.56	92.40	628.20	-7.74	0.55	5.80	2915.50	2364.79	2993.00	2993.00
17	10.60	8.60	0.81	3.87	6.60	90.96	651.99	-8.04	0.55	4.73	2071.86	1680.51	2332.49	3026.00
18	13.90	11.28	0.81	5.08	4.63	87.64	644.78	-7.95	0.55	6.21	1238.24	1004.35	1649.13	2723.00
19	8.60	6.98	0.81	3.14	4.41	84.31	628.46	-7.75	0.55	3.84	734.57	595.82	1224.28	2171.00
20	8.80	7.14	0.81	3.21	4.26	81.01	612.46	-7.55	0.55	3.93	545.05	442.09	1054.55	1538.00
21	7.90	6.41	0.81	2.89	3.55	77.20	597.07	-7.36	0.55	3.53	535.29	434.18	1031.25	1068.00
22	20.20	16.40	0.81	7.38	3.10	73.15	579.76	-7.15	0.55	9.02	467.65	379.32	959.07	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	561.92	-6.93	0.0	0.0	445.78	361.57	923.49	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 40 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	@I (MM)	B.P. (MM)	@B (CMSD)	-@B (MM)	BETA	RS (MM)	@S (MM)	@S (CMSD)	@C (CMSD)	@O (CMSD)
12	83.90	83.90	0.69	41.01	17.69	15.33	153.54	-1.89	0.50	42.89	530.70	430.46	584.00	584.00
13	63.80	63.80	0.84	25.55	32.71	33.25	265.56	-3.27	0.55	38.25	1388.76	1126.44	1392.00	1392.00
14	34.30	34.30	1.00	14.99	27.07	57.33	347.45	-4.28	0.55	19.31	2213.69	1795.55	2143.00	2143.00
15	15.10	15.10	1.00	6.42	19.66	87.59	475.85	-5.87	0.55	8.68	2703.88	2193.14	2669.00	2669.00
16	13.00	13.00	1.00	5.47	12.56	126.11	628.20	-7.74	0.55	7.53	2915.50	2364.79	2993.00	2993.00
** 17	10.60	10.60	1.00	4.77	7.85	123.53	845.84	-10.43	0.55	5.83	2687.87	2180.16	3026.00	3026.00
18	13.90	13.90	1.00	6.26	5.45	118.75	829.15	-10.22	0.55	7.64	1604.86	1301.71	2130.86	2723.00
19	8.60	8.60	1.00	3.87	5.36	114.26	799.14	-9.85	0.55	4.73	947.85	768.81	1567.96	2171.00
20	8.80	8.80	1.00	3.96	5.24	109.98	771.87	-9.52	0.55	4.84	689.42	559.19	1331.06	1538.00
21	7.90	7.90	1.00	3.56	4.37	105.15	746.81	-9.21	0.55	4.34	665.14	539.50	1286.31	1068.00
22	20.20	20.20	1.00	9.09	3.82	100.10	719.44	-8.87	0.55	11.11	576.12	467.30	1186.74	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	691.93	-8.53	0.0	0.0	549.17	445.44	1137.37	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 40 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (CMSD)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
13	63.80	63.80	0.84	14.92	32.71	33.25	265.56	-3.27	0.55	48.88	1388.76	1126.44	1392.00	1392.00
14	34.30	34.30	1.00	9.62	27.07	57.33	347.45	-4.28	0.55	24.68	2213.69	1795.55	2143.00	2143.00
15	15.10	15.10	1.00	4.01	19.66	87.59	475.85	-5.87	0.55	11.09	2703.88	2193.14	2669.00	2669.00
16	13.00	13.00	1.00	3.38	12.56	126.11	628.20	-7.74	0.55	9.62	2915.50	2364.79	2993.00	2993.00
17	10.60	10.60	1.00	3.15	7.85	155.28	845.84	-10.43	0.55	7.45	2687.87	2180.16	3026.00	3026.00
** 18	13.90	13.90	1.00	6.26	3.44	145.65	1059.56	-13.06	0.55	7.64	2050.82	1663.44	2723.00	2723.00
19	8.60	8.60	1.00	3.87	4.13	137.65	983.63	-12.13	0.55	4.73	1200.62	973.84	1957.47	2171.00
20	8.80	8.80	1.00	3.96	4.92	131.17	924.70	-11.40	0.55	4.84	853.18	692.02	1616.72	1538.00
21	7.90	7.90	1.00	3.56	4.37	124.70	879.54	-10.84	0.55	4.34	745.13	604.38	1483.92	1068.00
22	20.20	20.20	1.00	9.09	3.82	118.20	836.68	-10.32	0.55	11.11	600.43	487.01	1323.69	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	795.74	-9.81	0.0	0.0	549.17	445.44	1241.19	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YFAR 1972 MONTH 7 *** CASE 40 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	@I (MM)	B.P. (MM)	@B (CMSD)	-@B (MM)	BETA	RS (MM)	@S (MM)	@S (CMSD)	@C (CMSD)	@O (CMSD)
14	34.30	34.30	1.00	6.93	27.07	57.33	347.45	-4.28	0.55	27.37	2213.69	1795.55	2143.00	2143.00
15	15.10	15.10	1.00	2.79	19.66	87.59	475.85	-5.87	0.55	12.31	2703.88	2193.14	2669.00	2669.00
16	13.00	13.00	1.00	2.33	12.56	126.11	628.20	-7.74	0.55	10.67	2915.50	2364.79	2993.00	2993.00
17	10.60	10.60	1.00	2.34	7.85	155.28	845.84	-10.43	0.55	8.26	2687.87	2180.16	3026.00	3026.00
18	13.90	13.90	1.00	5.42	3.44	159.05	1059.56	-13.06	0.55	8.48	2050.82	1663.44	2723.00	2723.00
** 19	8.60	8.60	1.00	3.87	3.26	148.87	1090.93	-13.45	0.55	4.73	1331.60	1080.07	2171.00	2171.00
20	8.80	8.80	1.00	3.96	4.34	140.77	1008.37	-12.43	0.55	4.84	943.67	765.42	1773.79	1538.00
21	7.90	7.90	1.00	3.56	4.21	133.30	947.27	-11.68	0.55	4.34	818.61	663.98	1611.26	1068.00
22	20.20	20.20	1.00	9.09	3.82	126.10	894.16	-11.02	0.55	11.11	637.64	517.19	1411.35	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	845.77	-10.43	0.0	0.0	561.68	455.59	1301.36	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 40 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QO (CMSD)
15	15.10	13.09	1.00	2.42	19.66	87.59	475.85	-5.87	0.55	10.67	2703.88	2193.14	2669.00	2669.00
16	13.00	11.27	1.00	2.02	12.56	126.11	628.20	-7.74	0.55	9.25	2915.50	2364.79	2993.00	2993.00
17	10.60	9.19	0.87	2.03	7.85	155.28	845.84	-10.43	0.55	7.16	2687.87	2180.16	3026.00	3026.00
18	13.90	12.05	0.87	4.70	3.44	159.05	1059.56	-13.06	0.55	7.35	2050.82	1663.44	2723.00	2723.00
19	8.60	7.46	0.87	3.36	3.26	130.40	1090.93	-13.45	0.55	4.10	1331.60	1080.07	2171.00	2171.00
** 20	8.80	7.63	0.87	3.43	3.76	123.38	874.33	-10.78	0.55	4.20	818.23	663.67	1538.00	1538.00
21	7.90	6.85	0.87	3.08	3.65	116.82	828.21	-10.21	0.55	3.77	709.79	575.72	1403.93	1068.00
22	20.20	17.51	0.87	7.88	3.31	110.42	787.27	-9.71	0.55	9.63	552.87	448.44	1235.72	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	749.34	-9.24	0.0	0.0	487.02	395.03	1144.37	753.00

*** MAE KLONG RIVER FLOOD SIMURATION ***

YEAR 1972 MONTH 7 *** CASE 40 ***

DATE	R (MM)	RE (MM)	ALPH	RI (MM)	QI (MM)	B.P. (MM)	QB (CMSD)	-QB (MM)	BETA	RS (MM)	QS (MM)	QS (CMSD)	QC (CMSD)	QC (CMSD)
16	13.00	8.57	1.00	1.54	12.56	126.11	628.20	-7.74	0.55	7.04	2915.50	2364.79	2993.00	2993.00
17	10.60	6.99	0.87	1.54	7.85	155.28	845.84	-10.43	0.55	5.45	2687.87	2180.16	3026.00	3026.00
18	13.90	9.17	0.66	3.58	3.44	159.05	1059.56	-13.06	0.55	5.59	2050.82	1663.44	2723.00	2723.00
19	8.60	5.67	0.66	2.55	3.26	130.40	1090.93	-13.45	0.55	3.12	1331.60	1080.07	2171.00	2171.00
20	8.80	5.80	0.66	2.61	3.76	87.97	874.33	-10.78	0.55	3.19	818.23	663.67	1538.00	1538.00
** 21	7.90	5.21	0.66	2.34	2.78	82.98	630.04	-7.77	0.55	2.87	539.96	437.96	1068.00	1068.00
22	20.20	13.32	0.66	6.00	2.52	78.02	606.20	-7.47	0.55	7.33	420.58	341.14	947.35	839.00
23	34.20	0.0	0.70	0.0	0.0	0.0	583.45	-7.19	0.0	0.0	370.49	300.51	883.96	753.00

ERR= 0.84422380E-02 QP= 1068.0

Ap-13-1 Rating Curve Computation Sheet (I)

Date: 1974

Station No.

Curve ( ), From _____ To _____

River System		River	Mae Klong	Station	K-10
No.	H	H^2	Q	$\sqrt{Q}$	$H\sqrt{Q}$
1	32.0	1024	60	7.74597	247.8709
2	33.0	1089	120	10.95445	361.4969
3	35.0	1225	280	16.7332	585.6620
4	38.0	1444	600	24.4949	930.8061
5	40.0	1600	865	29.4109	1176.4352
6	43.0	1849	1350	36.7423	1579.9208
7	46.0	2116	2040	45.1664	2077.6525
8	49.0	2401	3015	54.9090	2690.5417
9	50.0	2500	3420	58.4808	2924.0383

$$Q = a^2(H \pm b/a)^2$$

$$Q = 7.53457\ (H-29.14505)^2$$

Ap-13-2 Rating Curve Computation Sheet (II)

Date: 1974

Station No.

Curve ( ), From _____ To _____

$n[H\sqrt{Q}] = 9 \times 12574.424 = 113169.81$

$[H][\sqrt{Q}] = 366 \times 284.63788 = 104177.46$

$n[H^2] = 9 \times 15248 = 137232$

$[H]^2 = 366^2 = 133956$

$[H^2][\sqrt{Q}] = 15248 \times 284.63788 = 4340158.3$

$[H][H\sqrt{Q}] = 366 \times 12574.424 = 4602239.1$

$$a = \frac{n[H\sqrt{Q}]-[H][\sqrt{Q}]}{n[H^2]-[H]^2} = \frac{113169.81 - 104177.46}{137232 - 133956} = \frac{8992.35}{3276} = 2.7449$$

$$b = \frac{[H^2][\sqrt{Q}]-[H][H\ Q]}{n[H^2]-[H]^2} = \frac{4340158.3 - 4602239.1}{-} = \frac{-262080.8}{3276} = -80.0002$$

$a^2 = 2.7449^2 = 7.53457$ ÷

$b/a = -80.000^2/2.7449 = -29.14505$ ÷

$Q = a^2(H \pm b/a)^2 = 7.53457 \quad (H - 29.14505)^2$

RAINFALL AND WATER-LEVEL TELEMETERING SYSTEM STANDARD SPECIFICATIONS

RAINFALL AND WATER-LEVEL TELEMETERING SYSTEM

STANDARD SPECIFICATIONS

CONTENTS

CHAPTER 1 GENERAL

1-1 (Scope)

These specifications cover the rainfall and water-level telemetering system (called "this system" hereinafter) installed by the Ministry of Construction for river, dam and road management. Special operations and additional functions not covered by these specifications shall conform with the Specifications For Special Items (called "SSI" hereinafter).

1-2 (Special Range)

The basic system stipulated in these specifications cannot be modified by the previously mentioned SSI.

[COMMENT 1]

1. "Basic system" is the system specifications.

2. In principle, the functions that may be added by SSI shall be within the range given in these Specifications.

1-3 (Ambient Conditions)

This system shall satisfy the ratings given in these Specifications under the following conditions:

Classification \ Equipment		Master station eq. and monitoring station eq.	Repeater station eq.	Gauging station eq.
Electrical section	Temp.	-5°C ∿ +40°C	-10°C ∿ +40°C	-10°C ∿ +40°C
	Relative humidity	90% or less	90% or less	95% or less
Mechanical section	Temp.	+5°C ∿ +40°C		
	Relative humidity	40% ∿ 90%		

[COMMENT 2]

1. To operate the master station equipment and monitoring station equipment stably for an extended period of time, air conditioning and dustproofing measures should be considered.

2. "Mechanical section" indicates the typewriter.

3. When the relative humidity, one of the ambient conditions of the repeater station equipment, exceeds 90%, the cabinet shall employ a moistureproof construction by specification of SSI.
However, in this case, the additional functions shall be mounted in a separate cabinet.

1-4 (Power Requirement)

The power supply operating range and ratings guaranteed range of this system shall be as follows.

		Operating range	Ratings guaranteed range
Master station eq. and Monitoring station eq.	Telemetering eq. and monitoring eq.	(1) DC 21.6V ∿ DC 26.4V (+ ground) Ripple 3% or less Noise voltage 5mV or less (2) Single-phase AC 100V ± 10% 50Hz or 60Hz	(1) DC 21.6V ∿ DC 26.4V (+ ground) Ripple 1% or less Noise voltage 5mV or less (2) Single-phase AC 100V ± 10% 50Hz or 60Hz
	Typewriter	Single-phase AC 100V ± 10% 50Hz or 60Hz	
Repeater station eq. and Gauging station eq.	Repeater eq. and Telemetering eq.	DC 10.5V ∿ DC 16.5V (- ground) Ripple 3% or less Noise voltage 5mV or less	DC 10.8V ∿ DC 14.5V (- ground) Ripple 1% or less Noise voltage 5mV or less

[COMMENT 3]

1. Whether the power supplied to the master station equipment and monitoring station equipment is DC24V or AC100V must be specified in the SSI. However, even when this power is DC24V, the power supplied to the typewriter shall be AC100V.

2. The power supply unit installed shall be for AC or DC depending on whether the power supplied to the master station equipment and monitoring station equipment is AC or DC.

3. Because of the supply voltage of the newest circuit elements, DC power supply ground is normally (-) ground, but is made (+) ground when power is shared by multiplex radio equipment, telephone exchange or other similar equipment.

4. DC24V can be supplied to the repeater equipment and telemetering equipment by adding a DC-DC converter at each equipment.

1-5 (Electrical and Mechanical Strength)

No electrical or mechanical abnormalities shall occur after this system has been left standing for 4 fours under the following conditions.

(1) Ambient temperature -20°C and +50°C

(2) Relative humidity 95% (ambient temperature +35°C)

[COMMENT 4]

1. "Electrical and mechanical strength" indicates normal operation when restored to the ambient conditions of para. 1-3 after standing under the above ambient conditions with the power of each equipment turned OFF.

1-6 (Construction)

Printed circuit boards shall employ a plug-in system for easy mounting and dismounting, as standard. Inspection, adjustment and other operations shall be performed from the front of each unit.

1-6-1 (Telemetering equipment for master station and monitoring station)

Bay dimensions shall be 2,350 mm high, 520 mm wide and 250 mm deep or less. The front door shall be constructed to open outward to both sides from the center.
Connections to external devices shall be made at the top or bottom of the bay.

1-6-2 (Repeater equipment)

Bay dimensions shall be 2,000 mm high, 520 mm wide, and 250 mm deep or less. The front door shall be constructed to open outward to both sides from the center.
Connections to external devices shall be made at the top or bottom of the bay.
However, in the case of moistureproof construction, such construction shall be specified by SSI, and in this case the above bay dimensions, etc. shall not apply.

1-6-3 (Telemetering equipment for gauging station)

The cabinet shall be a wall-mount type having dimensions of 600 mm high, 600 mm wide, and 300 mm deep or less, and shall use packing considering moistureproofing.

[COMMENT 5]

1. A mounting base shall be necessary when the telemetering equipment for gauging station is not used as wall-mount type.

1-7 (Coating)

1-7-1 The bay and cabinet coating shall be baked coating after rust-resisting processing.

1-7-2 The color of the bay and cabinet shall be Munsell 2.5B6/3.

1-7-3 The color of operating console, etc. shall be specified separately by color sample, etc.

1-8 (Nameplates)

1-8-1 (Equipment nameplate)

The equipment name, model, serial No., date of manufacture and manufacturer's name shall be entered on the equipment nameplate.

1-8-2 (Equipment main sections and main electrical parts indication)

The main sections of the equipments shall be indicated by nameplates, engraving or stamping. Symbols or numbers of main electrical parts that can be collated with the circuit diagrams shall be indicated. Moreover, special handling precautions shall be indicated in red at the required points.

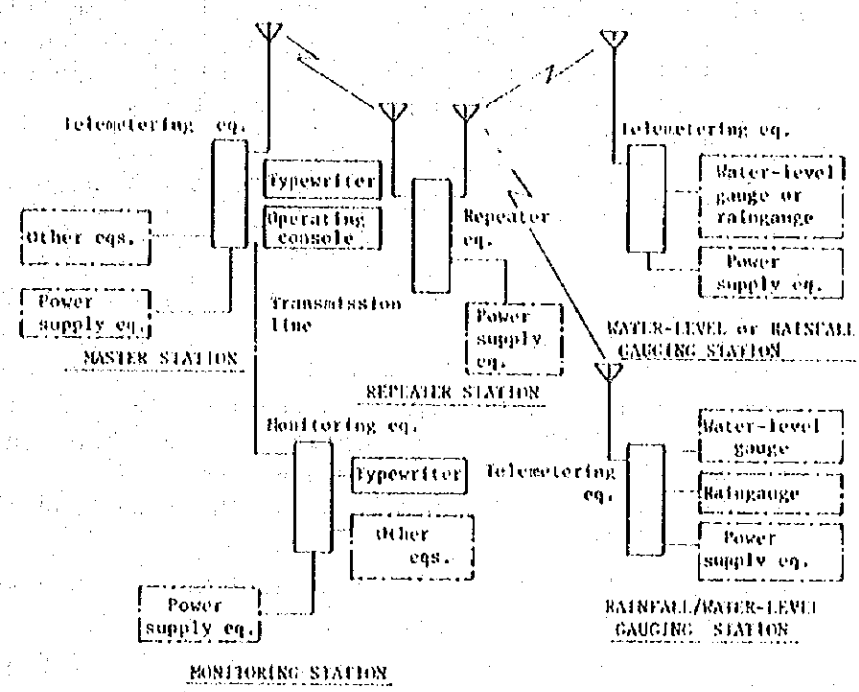
[COMMENT 6]

1. When radio equipment are mounted, the radio equipment nameplate shall be installed, together with the nameplate of the equipment to which it is mounted.

CHAPTER 2 SYSTEM CONFIGURATION AND FUNCTIONS

2-1 (System Configuration)

This system shall consist of one master station and a maximum of 30 gauging stations (including repeater stations and monitoring stations as required), and shall have the system configuration shown below.



TELEMETERING SYSTEM CONFIGURATION (Example)

Legend : 1. [ ] --- Standard configuration equipments.

2. [ ] --- Equipments outside the scope of these specifications.

[COMMENT 7]

1. In the telemetering system configuration diagram, the master station and repeater station are connected by a simplex radio link, but may also be connected by a multiplex radio link.

2. The monitoring station equipment may also be connected via a repeater station, or directly to the master station by a simplex radio link or multiplex radio links or other similar links.

2-2 (Description of Operation)

2-2-1 The master station shall gather and print rainfall, water level

and other data by calling the gauging stations.

2-2-2 The gauging stations shall automatically send the data from a raingauge, a water-level gauge, etc. by the calling from the master station.

2-2-3 The monitoring station shall receive and print the rainfall and water-level data from the gauging stations via the master station, the repeater station or directly.

2-2-4 When repeater stations are provided in this telemetering system, the repeater stations shall be automatically started before calling of the gauging stations, and shall be stopped after the end of control of the gauging stations.

2-3 (System Functions)

2-3-1 (Calling mode)

1) Automatic calling

This calling shall be started automatically by a clock, and shall call all the gauging stations, except the stations that are shutdown, in the predetermined order.
The setting of the calling interval shall be made the following 6 intervals:

10 minutes, 15 minutes, 30 minutes, 1 hour, 3 hours, and 12 hours.

Moreover, automatic calling shall have priority over other callings.

2) Manual calling

This calling shall be started manually and call all the gauging stations or the gauging stations arbitrarily selected, in the predetermined order.

3) External start calling

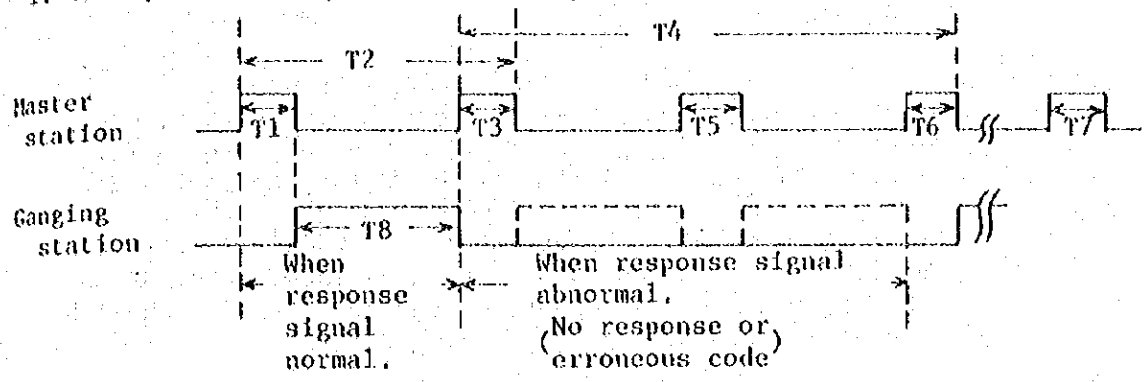
This calling shall permit calling of gauging stations by start signal from external devices.

4) Re-calling

When a error code has been detected in the data code from a gauging station, or there is no response from a gauging station, that gauging station shall be automatically re-called one time. If there is an error code or the called gauging station failed to respond again, a visual and audible alarm shall be actuated and the system shall shift to the next operation.

[COMMENT 8]

1. The operation sequence of this system shall be as follows:



T1: Date and time printing and No.1 station calling (including reperater station starting when there is a repeater station)

T2: No.1 station processing

T3: No.1 station printing and No.2 station calling

T4: No.2 station processing

T5: No.2 station re-calling

T6: No.2 station printing and No.3 station calling

T7: Final station printing (including repeater station stopping when there is a repeater station)

T8: Response signal transmission

2-3-2 (Response mode)

The gaugi-g station called from the master station shall convert the measured values to digital signals and then send the measurement code to the master station.

2-3-3 (Data code check system)

The master station shall perform the following code checks each time a data code is received:

1) Odd parity check at each digit

2) Check of total number of bits

2-3-4 (Printing and display)

The data code shall be received from the gauging stations, and the following printing and display operations shall be performed at the master station:

1) When the received data code is normal, the measured value and additional information shall be printed at the predetermined station position, and the data shall be digitally displayed.

2) When the received data code is faulty, printing and display for faulty code shall be performed. However, when total bits and station number bits are normal, processing for faulty code shall only be performed for the faulty digit.

3) Printing format shall be page tabulation by a typewriter. The date, time, measured values and additional informations for one measuring operation or monitoring operation shall be printed at the predetermined printing positions.

2-3-5 (Number of connectable transmission lines)

The telemetering equipment for master station and monitoring equipment shall be connectable to a maximum of 3 transmission lines by arbitrarily combining the following transmission lines. However, the data code form the transmission lines of 2 or more directions shall not be input simultaneously at the monitoring equipment.

1) Simplex radio links

2) Multiplex radio links

3) Wire line

2-3-6 (Repeating system)

1) The repeating system shall be of the following two kinds:

(1) Simplex radio link and simplex radio link repeating (Called "V-V repeating" hereinafter.)

(2) Multiplex radio link and simplex radio link repeating (Called "μ-V repeating" hereinafter.)

2) Transmitter and receiver

(1) The transmitters shall employ a No.1 unit/No.2 unit changeover system.

(2) The receivers shall employ a No.1 unit, No.2 unit parallel operation system.

3) Transmitter failure detection and changeover system

(1) When the output of a transmitter has dropped to 1/2 or more, failure display shall be actuated and operation shall be automatically switched to the other transmitter. However, switching shall not be performed if the other transmitter is already faulty. '

(2) Forced switching between the No.1 transmitter and No,2 transmitter by the local test buttons shall be possible.

4) Receiver failure detection

Receiver failure datection shall be performed by comparison and detection of the presence or absence of squelch voltage at the two receivers.
However, disconnection of the receiver judged to have failed shall be unnecessary. Moreover, the failure display shall be reset automatically when the failed receiver is judged to be normal.

2-3-7 (Voice communication)

Voice communication between the master station and gauging stations shall be possible in this system. Moreover, automatic calling shall have priority over voice communication.

2-4 (Transmission System)

2-4-1 (General)

(1) Communication system	Semi-duplex communication
(2) Calling signal system	2-frequency series signal
(3) Data code system	Long-short pulse system (RZ code system) Long mark (1) 60 ±12mSec Short mark (0) 20 ±4mSec Space 20 ±4mSec
(4) Transmission speed	50 bauds
(5) Data code check system	Parity check at each digit and total number of bits check
(6) Modulation system (measurement code)	Subcarrier frequency shift system
(7) Subcarrier frequency (fo)	Specified from the following frequencies by SSI. a. 2635 Hz b. 2465 Hz c. 2295 Hz d. 2125 Hz e. 1955 Hz

(8)	Frequency shift width (Δf)	Specified subcarrier frequency (fo) ± 35 Hz
(9)	Frequency shift direction	Mark (fo + Δf) Space (fo − Δf)
(10)	Subcarrier shift frequency accuracy	± 6 Hz or less
(11)	V-V repeater remote control signal system	2-frequency series signal system
(12)	μ-V repeater control system	Ringer signal system (sent at control)

[COMMENT 9]

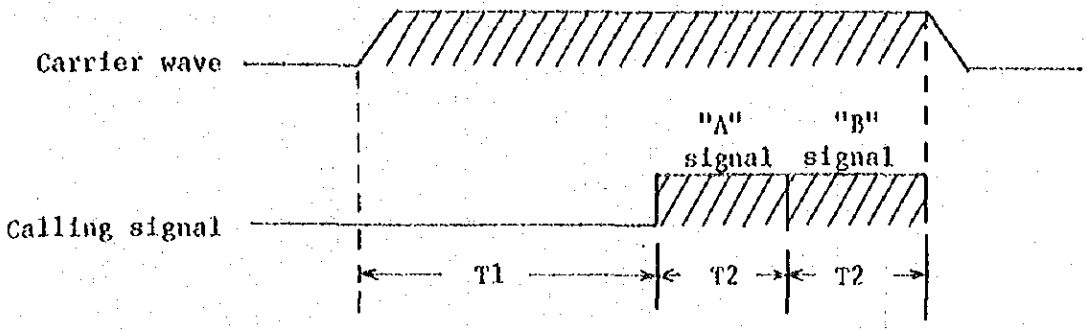
1. Since the former Japan M.O.C. standard is for a transmission speed of 25 bauds, the specifications stipulated by these specifications are for a different circuit and cannot be mixed with the above. Therefore, when gauging station equipment of these specifications are placed in an existing system, the transmission speed shall be made 25 bauds so that the transmission system shall be matched, and all the equipment shall be changed to 50 bauds at the time all the equipment can be changed to the 50 buads stipulated in these specifications in the future.

2. In the case of μ-V repeating, a ringer shall be sent at control to prevent abnormal operation of the transmitter by a trouble or momentary interruption of ringer circuit.

2-4-2 (Calling signal system)

1) Calling signal

The calling signal shall be a 2-frequency series signal system using frequencies in the voice band. The calling signals shall be sent in "A" signal, "B" signal order.
The calling signals shall be sent in accordance with the following time chart.



T1: Unmodulated radio frequency send time: 1000 ±100mSec

T2: "A" signal, "B" signal send time: 600 ±60mSec Moreover, sending of the remote control signal for V-V repeater shall conform to the above.

[COMMENT 10]

1. The unmodulated radio frequency send time shall be as follows, considering control of one repeater station. Required time is 900mSec, but made 1000 ±100mSec, considering the setting accuracy.

	Master station		Repeater station			Gauging station		Total
	Calling control	Tx	Rx	Repeat control	Tx	Rx	Signal detect	
Required time	50 mSec	100 mSec	200 mSec	100 mSec	100 mSec	200 mSec	150 mSec	900 mSec

2) Signal frequencies

The "A" signal and "B" signal used to call the gauging stations shall be specified from the following frequencies by SSI.

(1) "A" signal

"A" Signal	Frequency
A 1	487.5 Hz
A 2	502.5
A 3	517.5
A 4	532.5
A 5	547.5
A 6	562.5
A 7	577.5
A 8	592.5
A 9	607.5
A 10	622.5
A 11	637.5
A 12	652.5
A 13	667.5
A 14	682.5
A 15	697.5

(2) "B" signal

"B" signal	Frequency	Remarks
B 1	412.5 Hz	
B 2	427.5	
B 3	442.5	
B 4	457.5	
B 5	472.5	
B 6	382.5	Repeating-start signal
B 7	397.5	Repeating-stop signal
B 8	352.5	No.1 → No.2 transmitter changeover signal (Repeater station)
B 9	367.5	No.2 → No.1 transmitter changeover signal (Repeater station)

[COMMENT 11]

1. Even telemetering equipment designed to these specifications may require a 50 ±25mSec signal spacing between the "A" signal and "B" signal when there are gauging stations based on the former Japan M.O.C. standard in the same system.

2. The calling signals should be allocated as follows:

Gauging station		Calling signal
No. 1	:	Am . B1
No. 2	:	Am . B2
No. 3	:	Am . B3
No. 4	:	Am . B4
No. 5	:	Am . B5
No. 6	:	Am . B1
No. 7	:	Am . B2

3. Since allocation of calling signals is associated with radio frequencies, it is decided at the Ministry of Construction.

3) Repeater station control

When there is a V-V repeater station in the transmission links, a repeating-start signal shall be automatically sent before calling of gauging stations, and a repeating-stop signal shall be send after the end of the measurement operation.
B6, B7, B8 and B9 of the "B" signals added to the "A" signal shall be used as the repeater control signals.

4) Re-calling control

The time interval when re-calling is performed shall be 10^{+1sec}_{-0sec}.

[COMMENT 12]

1. If the accuarcy of the calling time and gauging station protective circuit is considered, the re-calling time interval becomes 9,240 mSec, but has been made 10,000mSec (10 secs) ∿ 11,000mSec (11 secs), considering the setting accuracy.

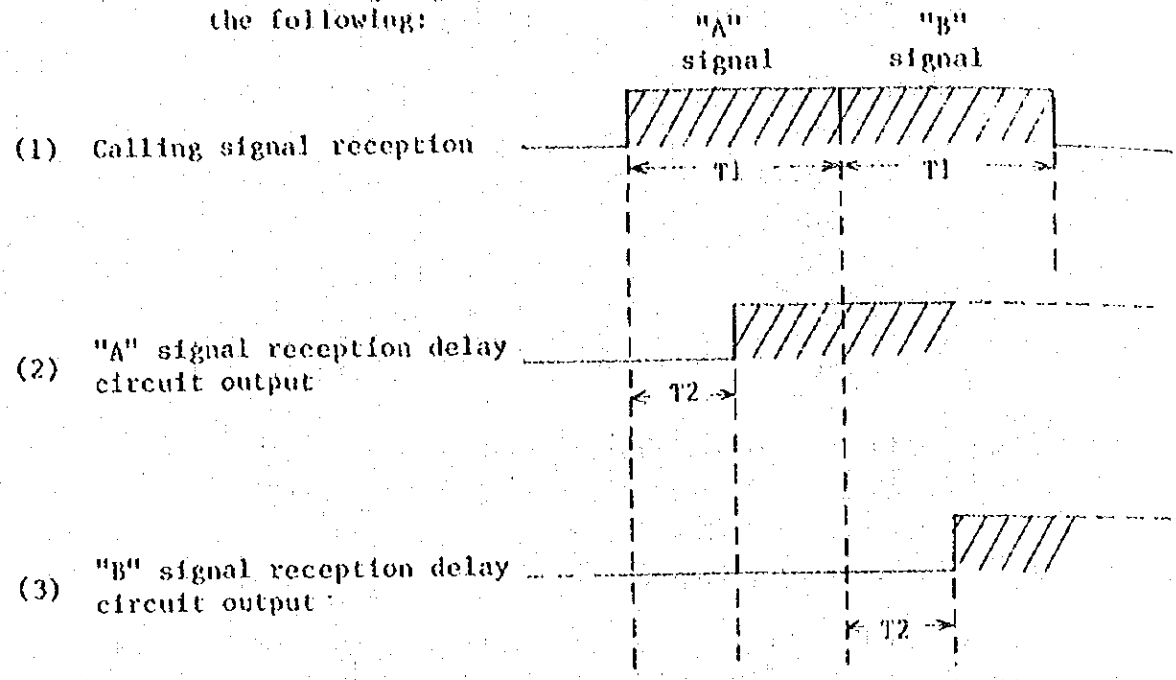
(Maximum calling time) + (maximum gauging station protective circuit time) = 2,420mSec + 7,000mSec = 9,420mSec

2-4-3 (Gauging station receiving and responding system)

Each gauging station shall sent a response signal to the master station only when it has received the calling signal allocated to it.

1) Calling signal receiving time chart

The calling signal receiving time chart shall conform with the following:



T1: "A" signal, "B" signal send time: 600 ±60mSec

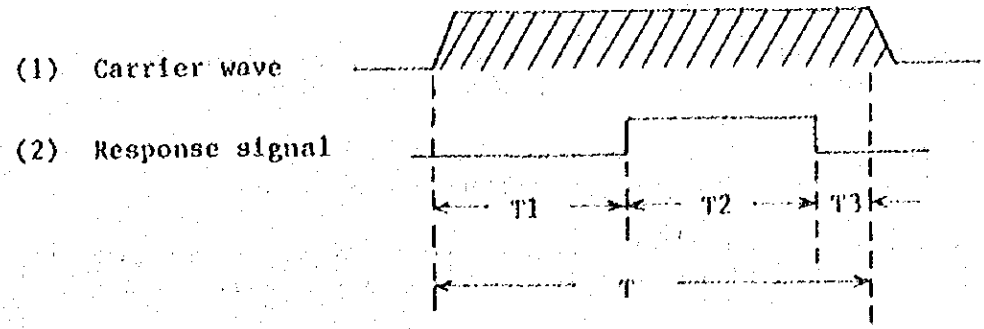
T2: Delay time for prevention of voice erroneous operation: 450mSec or more (including circuit delay time)

[COMMENT 13]

1. Voice noise is generally considered to be 250mSec or less. The delay time for prevention of voice erroneous operation has been mode 450mSec by addition the 150mSec delay time of the signal detection elements to the 250mSec voice noise, plus a small margin.

2) Response signal transmission time chart

The response signal transmission time chart shall conform with the following:



T: Response signal

T1: Head space : 1,500 ±300mSec

T2: Data code : 1,344mSec (shortest code configuration) ∿ 2,688mSec (longest code configuration)

T3: End space : 80 ±16mSec

[COMMENT 14]

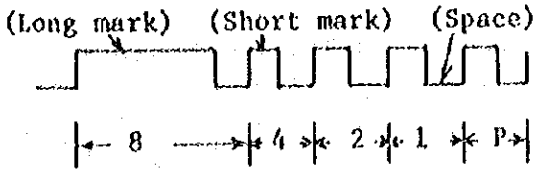
1. "Head space" is a signal used before the code to detect the beginning of the response signal from the gauging station at the receiving equipment (master station and monitoring station).

2. "End space" is a signal used after the code to detedt the end of the response signal from the gauging station at the receiving equipment (master station and monitoring station).

3. The head space shall be 1,200mSec as shown below when control of one repeater is considered, but has been made 1,500 ±300mSec, considering the setting accuracy and other factors.

Gauging station		Repeater station			Master station		Total
Response control	Tx	Rx	Repeat control	Tx	Rx	Space detect	
50 mSec	100 mSec	200 mSec	100 mSec	100 mSec	200 mSec	450 mSec	1200 mSec

4. "Shortest code configuration" is the code configuration when one bit of long mark signal is included at each digit.
The code configuration is this case is as follows:



(The code configuration of the decimal number "8" is shown at the left.)

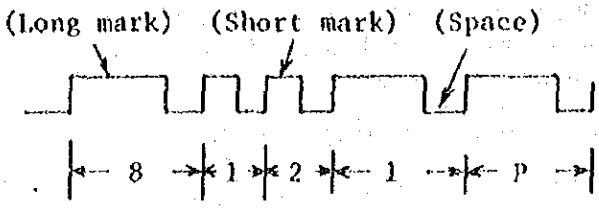
Therefore, the shortest time length per digit becomes as follows:

Shortest time length per digit = (long mark length - 20%) × 1 + (short mark length - 20%) × 4 + (space length - 20%) × 5 = (60mSec - 12mSec) × 1 + (20mSec - 4mSec) × 4 + (20mSec - 4mSec) × 5 = 48mSec × 1 + 16mSec × 4 + 16mSec × 5 = 192mSec

Consequently, the code length in the case of the shortest code configuration conforms with the following equation.

Shortest code length = (shortest code length per digit) × 7
= 192mSec × 7 = 1,344mSec

5. "Longest code configuration" is the code configuration when three bits of long mark signal is included at each digit.
The code configuration in this case is as follows:



(the code configuration of the decimal number "9" is shown at the left.)

Therefore, the longest code length per digit becomes as follows:

Longest code length per digit = (Long mark length + 20%) × 3 + (short mark length + 20%) × 2 + (space length + 20%) × 5 = (60mSec + 12mSec) × 3 + (20mSec + 4mSec) × 2 + (20mSec + 4mSec) × 5 = 72mSec × 3 + 24mSec × 2 + 24mSec × 5 = 384mSec

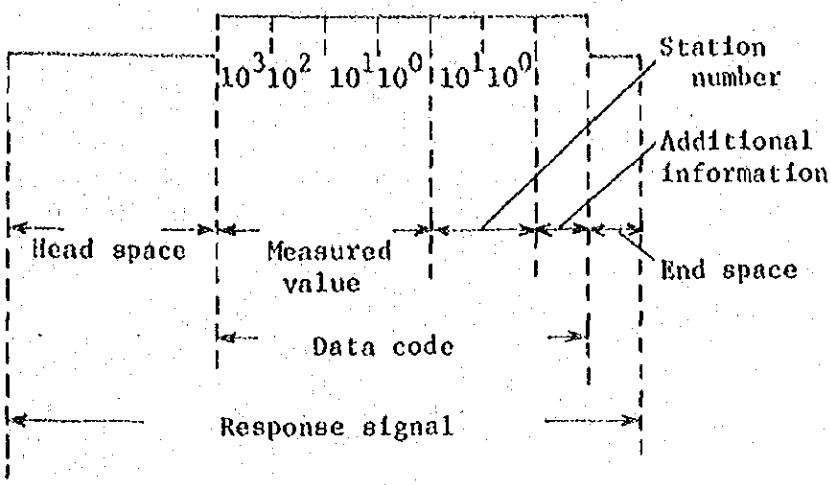
Consequently, the code length in the case of the longest code configuration conforms with the following equation.

Longest code length = (longest code length per digit) × 7 = 384mSec × 7 = 2,688mSec

6. The end space is a 4 space length of the code length impossible with the normal code configuration.

3) Response signal configuration

(1) The configuration of the response signal sent in response to calling shall conform with the following:



(2) The data code items and number of digits shall be follows:

Measured value: 4 digits

However, when the number of significant digits of the measured value is 3 digits, the 4th digit (thousands) shall be set to "0" as a dummy code.

Station number: 2 digits

Additional information: 1 digit, 1 item

(3) The measured value, station number and additional information shall be binary-coded-decimal code to which a parity bit is added.

[COMMENT 15]

1. The correspondence between decimal value and binary-coded-decimal code is as follows:

1: long mark

0: short mark

		Decimal value									
		0	1	2	3	4	5	6	7	8	9
Binary-coded-decimal code	8	0	0	0	0	0	0	0	0	1	1
	4	0	0	0	0	1	1	1	1	0	0
	2	0	0	1	1	0	0	1	1	0	0
	1	0	1	0	1	0	1	0	1	0	1
	P	1	0	0	1	0	1	1	0	0	1

2. The raingauge is 3 digits, but the water-level gauge is 3 digits or 4 digits, depending on the measurement site. When the number of measured digits is 3 ditits, the number of digits is made uniform at 4 digits by sending "0" as a dummy signal.

3. The station number of gauging station should coincide with the calling order, considering coinstallation of a monitoring system.

4. The item of additional information handled by one gauging station shall be one of the following:

(1) Power supply voltage drop

(2) Power supply abnormal

(3) Water level abnormal

(4) Housing door open/close

(5) Other specified items

5. The bit configuration of the additional information is as follows:

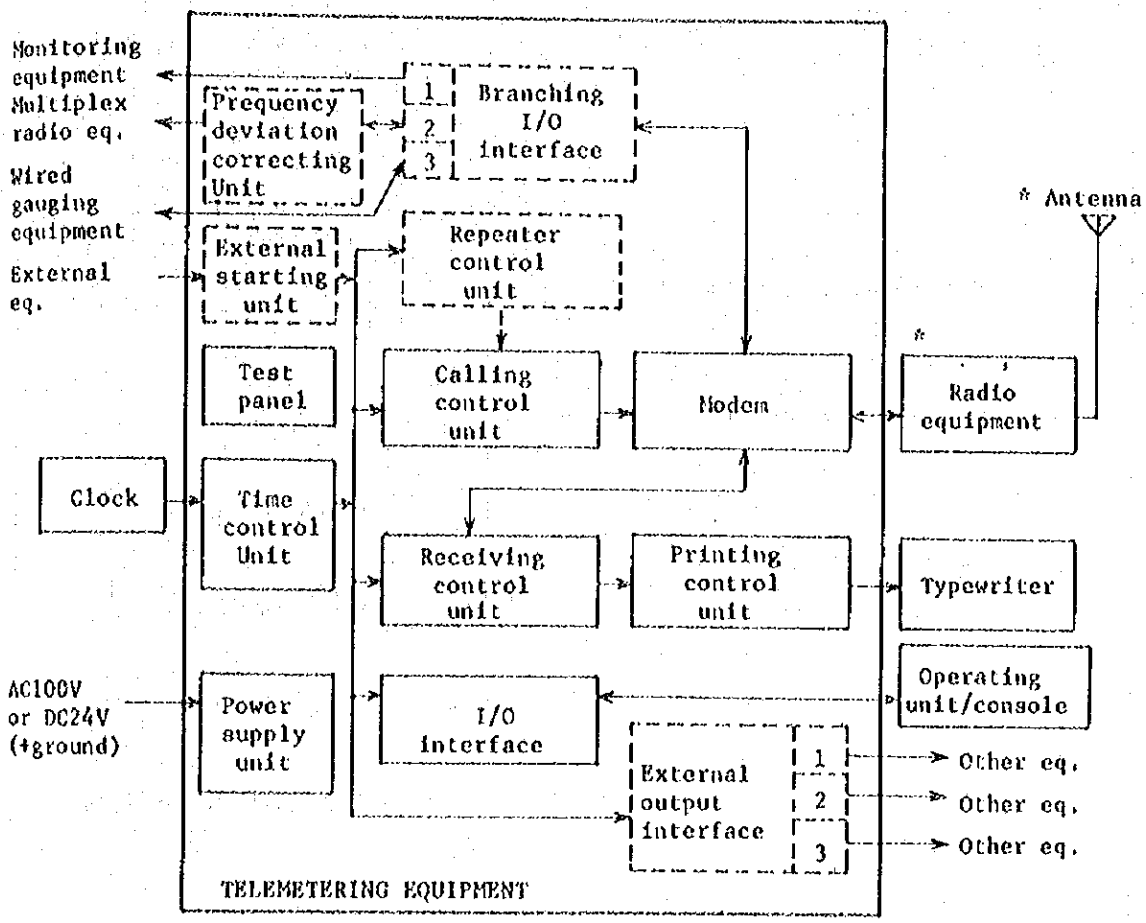
Item	Additional information bit format					Printing format
	8	4	2	1	P	
Normal	0	1	0	1	1	+
Abnormal	0	1	1	0	1	-

CHAPTER 3 EQUIPMENT COMPOSITION AND SPECIFICATIONS

3-1 (Master Station Equipment)

3-1-1 (Equipment composition)

1) The equipment composition of the master station, including standard composition and optional functions, shall be as follows:



Legend : 1. * ; Not used when connected to μ-V repeater.

2. [ ]; Standard composition

3. [ ]; Optional functions

2) Components shall be as follows:

	Name	Qnt'y	Remarks
1	Telemetering equipment	1	
- 1	Modem	1	
- 2	Calling control unit	1	
- 3	Receiving control unit	1	
- 4	Printing control unit	1	
- 5	I/O interface 1	1	
- 6	Time control unit	1	
- 7	Test panel	1	
- 8	Power supply unit	1	
- 9	Bay	1	
-10	I/O interface 2	1	Optional function. Conforms with SSI.
-11	Frequency deviation correcting unit	1	"
-12	External output interface	1	"
-13	Repeater control unit	1	"
-14	External starting unit	1	"
2	Operating unit/console	1	Conforms with SSI.
3	Typewriter	1	
4	Radio equipment	1	Conforms with SSI.
5	Antenna equipment	1	"
- 1	Antenna	1	
- 2	Coaxial arrester	1	
6	Clock		Conforms with SSI.
7	Accessories	1 set	
- 1	Test cord	1	
- 2	Adjustment tools	1 set	
- 3	Handset	1	
- 4	Instruction manual	3 copies	Including those for each station equipment.
- 5	Test date	3 copies	
- 6	Technical service card	1 copy	In card case.
- 7	Accessory box	1	

[COMMENT 16]

The "Technical service card" for the master station consists of a block diagram, components diagram, transmitting and receiving radio frequencies table, send level table for each control signal and subcarrier signal frequency table, and has the following contents:

1. Block diagram

   (1) Diagram of each functional block. The operating system and each signal system are clearly entered.

   (2) Symbols which can be collated with the components diagram of item 2 below are entered at each test point.

   (3) The standard level of each transmitting and receiving signal is entered in the system diagram.

2. Components diagram

   (1) The printed circuit boards and other units mounted in the telemetering equipment are clearly indicated in this diagram. Symbols that can be collated with the block diagram are entered at the U-links and other test points.

   (2) The standard level, allowable range and measured value are entered at the transmitting and receiving signal test points.

3. Transmitting and receiving radio frequencies table

   When the telemetering equipment is equipped with radio equipment, the frequencies and transmitting output of the radio equipment are entered in this table.

4. Send level table for each calling signal

   The measured send level of each calling signal is entered in this table.

5. Subcarrier frequency table

   The subcarrier frequency of the response signal used in this system is entered in this table.

The technical service card for the gauging stations, repeater stations, and monitoring stations shall also conform with the above.

3-1-2 Functions and ratings

1) Telemetering equipment

Of the following units, the modem, receiving control unit,

printing control unit, time control unit, and power supply unit shall also be applicable when these units are used at a monitoring station.

(1) Modem

This unit shall send the calling signals and convert the frequency modulated signals to pulse code.

(2) Calling control unit

This unit controls calling of the gauging stations. A maximum calling capacity of this unit shall be 30.

(3) Receiving control unit

This unit shall convert the demodulated series code to parallel code, and perform code checks.

(4) Printing control unit

This unit shall output the following items by means of the parallel code converted by the receiving control unit.

(a) Numbers and symbols: 1,2,3,4,5,6,7,8,9.0, +, -, & *

(b) Functions: Space, tabulation, carriage return, and power control

(5) I/O interface

This unit shall exchange signals between the calling control unit, receiving control unit, printing control unit and test panel, and shall exchange signals with external devices as a operating units, etc.

(6) Time control unit

This unit shall be driven by 1 minute pulses from the clock, and shall output the date data and time data to the other units.
The date shall be changed automatically, and number of days of the month shall be set manually.

[COMMENT 17]

1. Measuring capacity has been made 30 stations, considering the data gathering time, but up to about 40 stations is possible, if necessary.

2. The time control unit may also be incorporated in the clock.

(7) Test panel

Telemetering equipment shall have the following functions for system monitoring and maintenance at the test panel, etc.,

	Function	Operation	Display	Remarks
1	Test calling	o	-	Individual
2	Resetting	o	-	For operation resetting
3	Buzzer off	o	-	
4	Voice communication	o	-	
5	I/O level measurement	o	-	At U-links, etc. (By external measuring instruments)
6	Lamp test	o	-	
7	Calling frequency transmission	o	-	
8	Power ON/OFF	o	-	
9	Squelch adjustment	o	-	When equipped with radio equipment.
10	Typewriter printing ON/OFF	o	-	
11	Repeating start, stop control	o	-	When repeater station installed.
12	Data bit display	-	o	
13	Manual lock	-	o	
14	Receiving failure	-	o	
15	Transmitting	-	o	
16	Measuring	-	o	
17	Power	-	o	
18	Monitoring by voltmeter	-	o	Power supply voltage measurement use

(8) Power supply unit

This unit shall supply the necessary power to each unit, etc. Its input shall be AC100V or DC24V (+ ground).

[COMMENT 18]

1. Of the operating functions of the telemetering equipment, test calling and repeating start/stop control can be performed by setting the calling signal by rotary switch, etc., considering space, and economy.

2. Of the operating functions of the telemetering equipment, the I/O level measurement function is provided for use in measurement of the S/N, etc. of the telecommunication links.

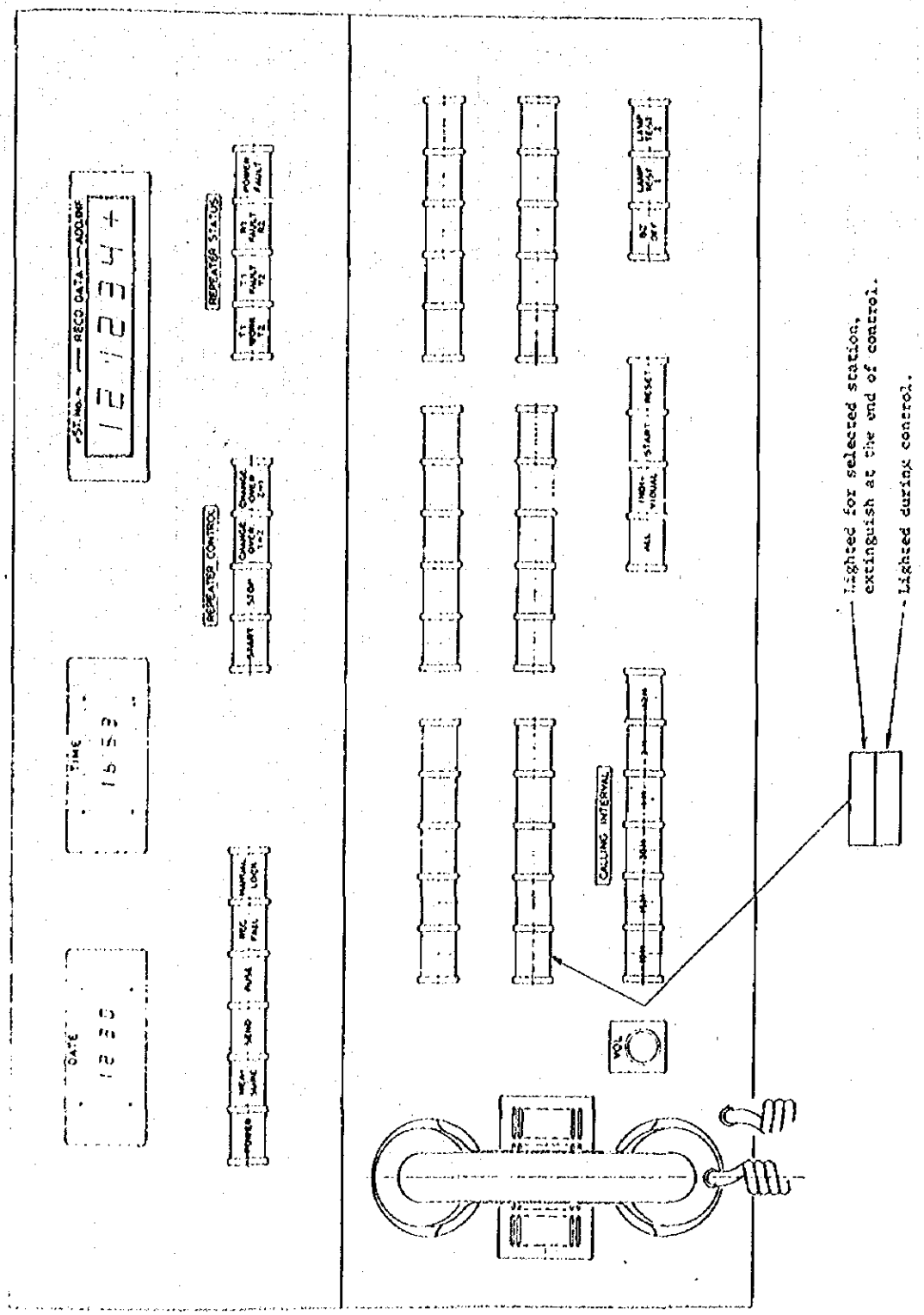
2) Operating unit/console

(1) The operating unit shall be connected to the telemetering equipment and shall perform the following operations and display. It shall be a table-top type.
However, it shall be a stand-alone type when an operating console is used.

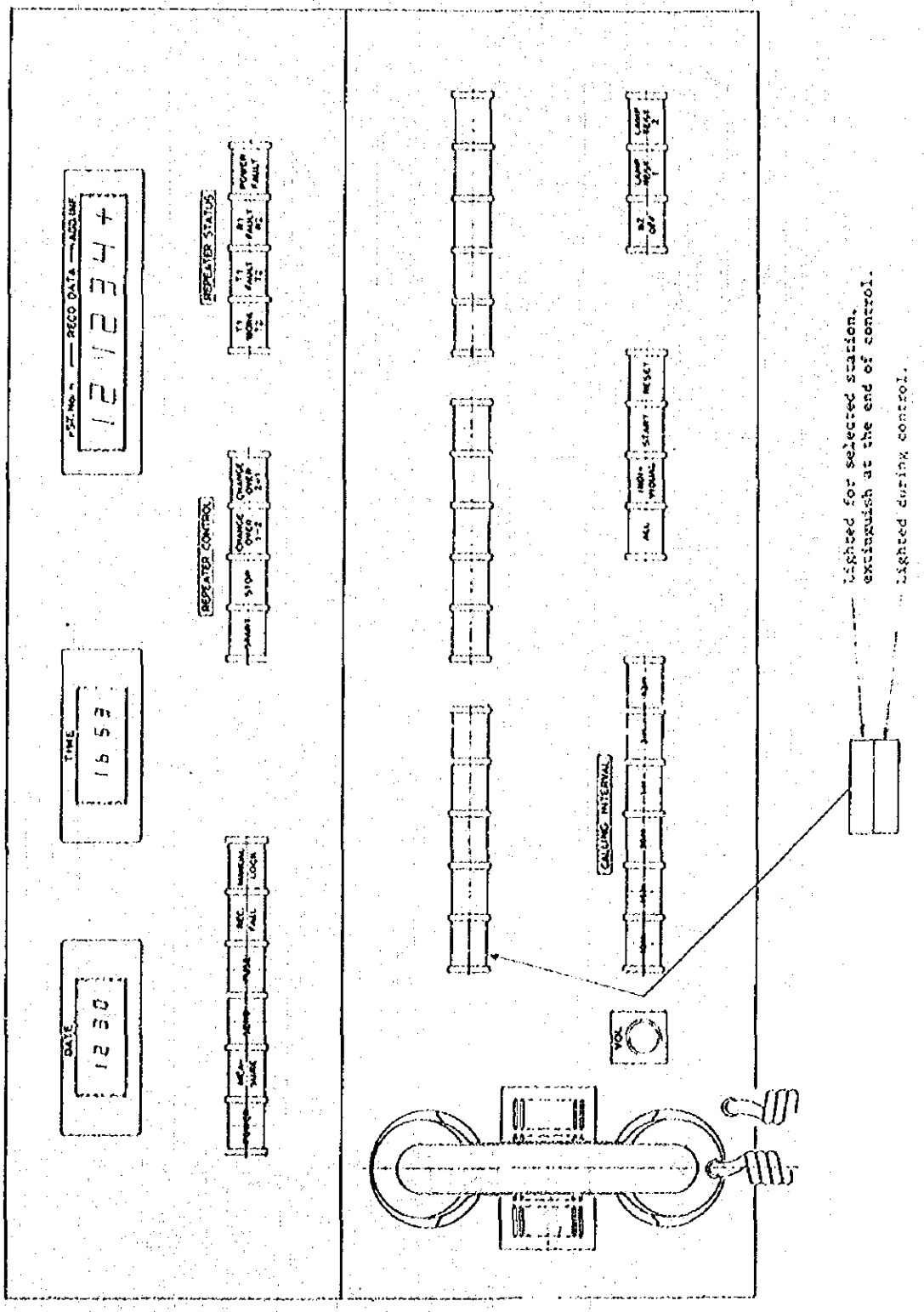
	Function	Operation	Display	Remarks
1	Station selection	o	-	Maximum 30 stations
2	Calling interval setting	o	-	10mins, 15 mins, 30mins, 1hr, 3hrs, and 12hrs
3	Measuring mode selection (All stations or individual stations)	o	-	
4	Manual starting, resetting	o	-	
5	Buzzer off	o	-	
6	Voice communication		-	
7	Transmitting	-	o	
8	Measuring	-	o	
9	Received data display	-	o	
10	Responding station	-	o	
11	Manual lock	-	o	
12	Receiving failure	-	o	
13	Time display, correction	o	o	Digital display
14	Power	-	o	
15	Burnt out fuse	-	o	
16	Lamp test	o	-	
17	Repeater control and display	o	o	Optional function

(2) The panel layout of the operating unit console shall be as follows.

a. For 30 stations capacity



b. For 15 stations capacity



c. Others

(a) Dimensions shall be specified by SSI.

(b) If there is an unnecessary switch, that shall be provided as a spare one, and wiring shall not be performed.

(c) A time correction function must also be provided at the operating unit/console, in addition to those given above.

d. When a stand-alone type operating console is required, it shall be specified by SSI.

[COMMENT 19]

1. A stand-alone type operating console conforms with the SSI but operation and display shall be within the range of functions of the operating unit, as a rule.

2. When the output of the A/D converter in dam water-level gauge or other similar sensor equipment is connected in parallel, a function that constantly displays the dam water level, etc. can be added by SSI.

3) Typewriter

(1) Ratings

(a) Carriage width	13, 18, 24 or 27 inches, specified by SSI.
(b) Line feed	1/6, 1/4, 1/3 and 1/2 inch (Selectable in 4 steps)
(c) Character size	12 chars/inch
(d) Printing speed	4 chars/sec or greater (alphabet only)
(e) Control keys	Power, carriage return, tabulation, spacing and ribbon selection
(f) Printing keys	Numbers and alphabet
(g) Maximum printing width	(Carriage width - 1 inch)

(2) The following functions shall be remotely controllable.

(a) Numbers	1,2,3,4,5,6,7,8,9 and 0

	(b) Symbols	*, +, -,
	(c) Others	Carriage return, tabulation, spacing and power control

[COMMENT 20]

1. One typewriter shall be connectable to one telemetering equipment.

2. The number of gauging stations printable at the typewriter is found as follows:

$$\text{Number of printable gauging stations} = \frac{[(\text{carriage width} - 1\ \text{inch}) \times \text{number of printing characters/inch} - (\text{number of date, time printing characters})]}{\text{Number of printing characters/station}}$$

(NOTE) Number of printing characters/inch: 12 chars/inch
Number of printing characters/station: 8 chars/station
Number of date printing characters: 8 chars
Number of time printing characters: 8 chars

3. Zero suppression not performed.

4. Tabulation example

DATE	TIME	No. 1 station	No. 2 station	Remarks
u02u18uu	u12u00uu	u1234u+u	u2345u+u	Example of all stations calling.
u02u18uu	u12u08uu		u3456u-u	Example of individual station calling.

Example of power normal

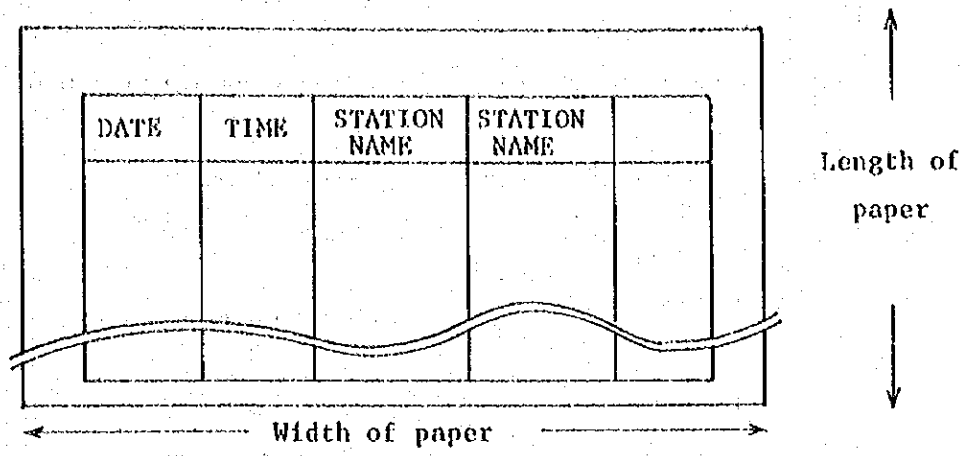
Example of power abnormal

(NOTE) u indicates a space.

5. Deciding the recording paper

The width of the recording paper is decided from the number of gauging stations, and the length of the recording paper is decided from the number of lines printed on one sheet.

(Recording paper example)



(Legend)

The case when JIS standards A size and B size paper is used is shown below.
(Conditions arel/6 inch line feed and 1 inch = 25.4 mm margin at both ends of the paper.)

Paper size			Number of gauging stations	Number of printing lines	Typewriter
Standard	Width (mm)	Length (mm)			
A1	594	841	30 or less	186 or less	24 inches or 27 inches
A2	420	594	19 or less	128 or less	18 inches
A3	297	420	12 or less	87 or less	18 inches
B2	515	728	25 or less	159 or less	24 inches or 27 inches
B3	364	515	16 or less	109 or less	18 inches
B4	257	364	10 or less	73 or less	13 inches

4) Radio equipment

This equipment shall be installed at the telemetering equipment, and shall satisfy the following functions and ratings. Moreover, these specifications shall also be applicable when this equipment is used at the gauging stations, repeater

stations and monitoring stations.

(1) Functions

(a)	Antenna matchable range	Standing wave ratio 2.0 or less
(b)	Transmitting output check	By external meter
(c)	Modulation input check	"
(d)	Demodulated output check	"
(e)	Squelch adjustment	Continuously variable
(f)	Demodulated output adjustment	Standard value ±3dB
(g)	Monitor speaker volume adjustment	0 ∿ 0.3W

(2) Transmitter ratings

(a)	Type of emission	F2, F3
(b)	Output	Specified from among 1W, 3W, and 10W by SSI. Moreover, output rating shall be within $^{+10}_{-20}$% at 12.0V power supply voltage. (However, shall be within ±10% at 12.0V power supply voltage at normal temperature.)
(c)	Frequency	70MHz band or 400MHz band. Frequency used specified separately.
(d)	Antenna impedance	50 Ω
(e)	Modulation method	Phase modulation
(f)	Modulation input	1kHz, linear up to 70%. Input required for 70% modulation is within -4dBm ±3dB.
(g)	Allowable frequency error	Within $\pm 10 \times 10^{-6}$
(h)	Maximum frequency deviation	Within ±5kHz

(i)	Modulation frequency response	Referred to 1kHz, 30% modulation 0.3kHz -10.5dBm ±2dB 2.0kHz + 6.0dBm ±2dB 2.7kHz + 8.5dBm ±2dB 3.0kHz + 8.0dBm ±2dB
(j)	S/N ratio	45dB or greater at 1kHz, 70% modulation
(k)	Distortion	10% or less at 1kHz, 70% modulation
(l)	Spurious	
	70 MHz ----------	1mW or less. Moreover, must be 80dB in-band, 60dB or more out-of-band lower than average power of fundamental wave.
	400 MHz ----------	1mW or less. Moreover, must be 60dB or more lower than average power of fundamental wave.
(m)	Occupied bandwidth	Shall be within 16kHz.
(3)	Receiver ratings	
(a)	Frequency	70MHz band or 400MHz band. Frequency used specified separately.
(b)	Antenna impedance	50 Ω
(c)	Receiving system	Superheterodyne
(d)	Allowable local oscillator frequency error	Within $\pm 10 \times 10^{-6}$
(e)	Bandwidth	12kHz or greater at 6dB down
(f)	Selectivity	Within 25kHz at 70dB down
(g)	Receiving frequency response	Referred to 1kHz, 30% modulation 0.3kHz ±10.5dBm ±2dB 2.0kHz - 6.0dBm ±2dB 2.7kHz - 8.5dBm ±2dB 3.0kHz - 9.5dBm ±2dB
(h)	S/N ratio	30dB or greater at 15dBμV input at 1kHz, 70% modulation

(i)	Squelch	Opened at 10dB or less noise suppression input voltage (or 0dBμV or less input field strength). Continuously variable to 20dB noise suppression voltage.
(j)	Receiving sensitivity	70MHz band: 3dBμV or less (2dBμV or less at normal temperature) 400MHz band: 4dBμV or less (3dBμV or less at normal temperature)
(k)	Spurious response	70MHz bnad: -80dB or less 400MHz band: -70dB or less
(l)	Sensitivity suppression effect	The interferring wave input voltage, when the noise quieting becomes 20dB under the condition that an interferring wave 15kHz from the desired wave in the 70MHz band and 25kHz from the desired wave in the 400MHz band has been applied with the desired wave 6dB higher than the necessary input voltage to achieve a noise quieting of 20dB, is as follows: 70MHz band 80dBμV or greater 400MHz band 70dBμV or greater
(m)	Intermodulation characteristic	Noise quieting must be 20dB or less when each interferring wave related to cause on intermodulation is applied at 65dBμV input voltage without any desired wave.

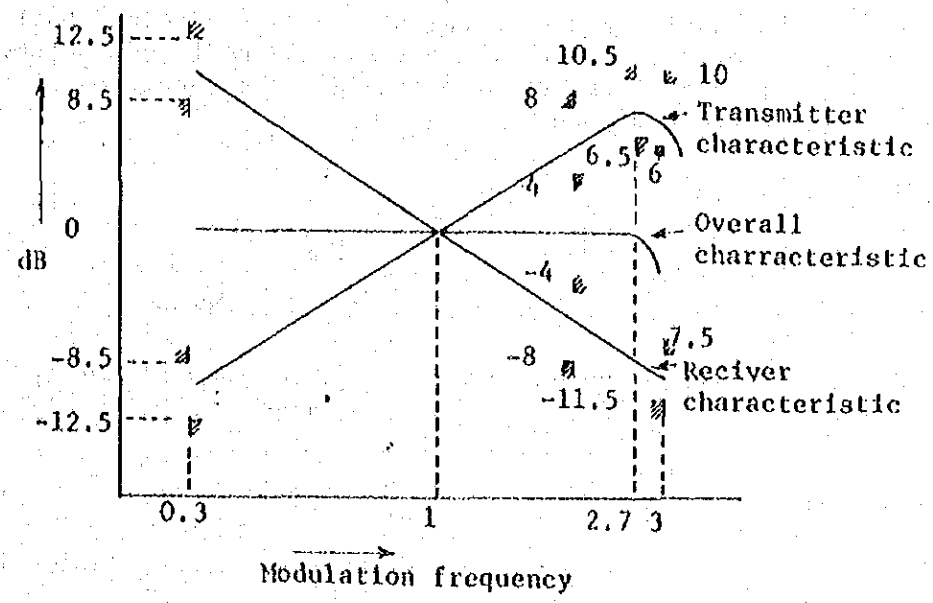
(4) Others

This equipment shall be provided with functions which protect the transmitter and receiver against opening or shorting of the antenna system and excessive input. Moreover, external connections shall be made with N-type connectors.

[COMMENT 21]

1. Since this system uses audio band frequencies at the calling signals and response signals, the overall frequency response between the master station and gauging stations must be considered. The installation of a repeater station in the radio links has an

especially large affect. Therefore, the conventional specifications have been modified as the characteristics shown below.



Moreover, the overall characteristic is flat from 0.3kHz to 2.7kHz because it has been determined from the minimum and maximum frequencies of the signals to be transmitted.

2. The standing wave ratio of the matchable load for the transmitter and receiver has been made 2.0 by the following reason.
The standing wave ratio of the antenna is a maximum 1.5, but the standing wave ratio is generally assumed to be about 2.0 when the affects of insertion of a coaxial arrester and connectors, etc. are considered.

5) Antenna equipment

The antenna equipment shall adequately satisfy the following specifications.
The specifications shall also be applicable when this equipment is used at gauging stations, repeater stations and monitoring stations.

(1) Antenna

(a) Frequency	70MHz band or 400MHz band. Specified by SSI.
(b) Type	Specified by SSI.
(c) Impedance	50 Ω
(e) Standing wave ratio	1.5 or less at the specified frequency

(f) Polarization — Vertical as standard

(2) Coaxial arrester

A coaxial arrester which grounds lightning shall be provided between the antenna and radio equipment. This arrestor shall not hinder the functions of the radio equipment.

a. Ratings

(a)	Impedance	50 Ω
(b)	Insertion loss	0.5dB or less
(c)	Standing wave ratio	1.2 or less at the specified frequency

[COMMENT 22]

1. The kinds and typical ratings of applicable antenna elements are as follows:

Kind	Gain (GIS)	Front-rear ratio	Frequency width in SWR rating (1.5)
3-element folded Yagi antenna	8 dB or more	13 dB or more	Specified frequency only
4-element folded Yagi antenna	9.5 dB or more	13 dB or more	do
5-element folded Yagi antenna	11 dB or more	13 dB or more	do
Braun antenna	2 dB or more	------	do
Sleeve antenna	2 dB or more	------	do
Wideband 3-element folded Yagi antenna	6 dB or more	10 dB or more	5 MHz
Wideband 5-element folded Yagi antenna	9 dB or more	10 dB or more	5 MHz

2. Since the gain and directivity will deteriorate substantially relative to the other frequency when a general antenna is used in a radio link having different transmitting and receiving frequencies and is set to only one of these frequencies, a wideband type antenna or separate transmitting and receiving antennas should be used when there is not so much margin in that radio link.

6) Clock

The clock shall adequately satisfy the following specifications.

(1)	Accuracy	Daily error within ±3 seconds
(2)	Output signal	1 minute pulse signal
(3)	Power failure guarantee time	30 minutes or more by floating charge system

[COMMENT 23]

Operation by applying an external 1 minute pulse to the time control unit is also possible. In this case, the clock is unnecessary. Moreover, when several clocks must be installed at the same station, the time control unit of each clock should be driven by a 1 minute pulse from the main clock.

3-1-3 (Additional functions)

The following functions may be added to the telemetering equipment by SSI.
Moreover, these specifications shall be applicable when the following units are used at the gauging stations and repeater stations.

1) I/O interface 2

This unit is used for connection to multiplex radio equipment and wire gauging equipment. It shall satisfy the following ratings.

(1)	I/O level	Settable within 0 ∿ -25dBm.
(2)	I/O impedance	600Ω ±20% balanced

[COMMENT 24]

1. When the data code is sent to another point, the received FS signal can be sent directly by branching circuit (hybrid transformer, etc.).

2. The number of I/O paths is a maximum of 3 paths.
The number of paths equipped must be specified by SSI.

2) Frequency deviation correction unit

This unit is inserted when the frequency deviation caused by the multiplex radio circuit exceeds 1Hz.
It shall satisfy the following ratings.

(1) Maximum correctable frequency deviation Within ±15Hz

(2) Correction accuracy ±0.5Hz

3) External output interface

This unit is used for connection to a display unit, etc. It shall satisfy the following conditions.

(1) Shall be no-voltage contacts.

(2) Shall close contacts by logic "1". Load conditions shall be 50V, 50mA or less.

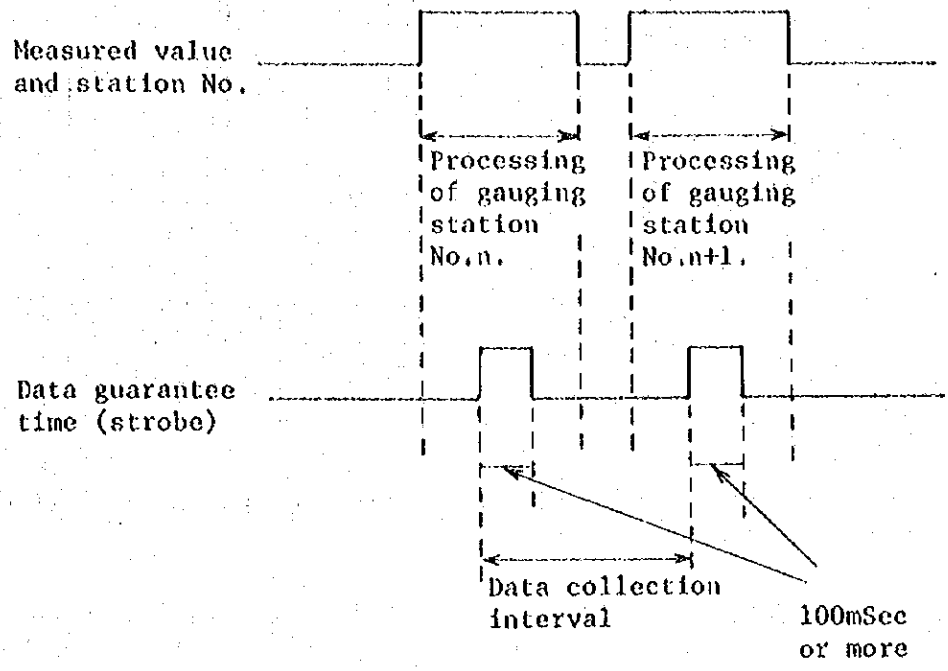
(3) Kinds of output signals

a. Output format

Output signal name	Output signal contents	Signal format	Remarks
Measured value	BCD 4 digits 20 bits	Momentary signal	With odd parity bit at each digit.
Station No.	BCD 2 digits 10 bits	do.	do.
Current time	BCD 4 digits 13 bits	Continuous signal	Without parity bit
1 minute pulse	1 bit	do.	
Calling time interval	6 bits	do.	
Periodic measurement	1 bit	do.	
Manual measurement	1 bit	do.	
Measuring	1 bit	do.	
Master station power abnormal	1 bit	do.	
Strobe		Momentary signal	

b. Data guarantee time

Output of data shall conform with the following time chart.



{COMMENT 25}

1. The maximum number of output paths shall be 3. The number of paths equipped must be specified by SSI.

2. The kinds of output signals must be selected and specified by SSI after an adequate study of the connected devices.

4) Repeater control unit

This unit shall have repeater station start/stop, transmitter switching, and receiving and processing function of repeater station status signal.

5) External starting

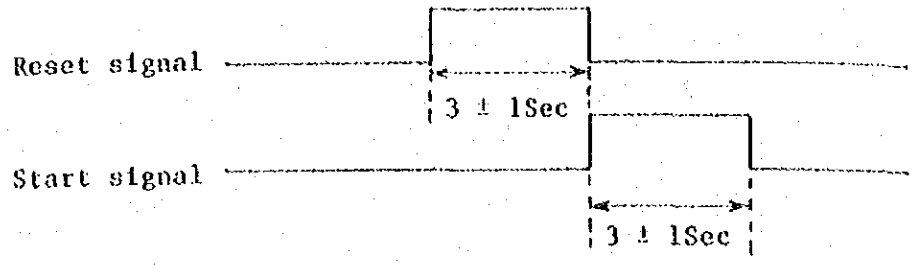
This unit shall have functions that permit starting of the telemetering equipment from the outside. Control by external starting shall be specified from among the following by SSI.

a. All gauging stations

b. Gauging stations set at the operating unit

c. Gauging stations specified beforehand

The time chart shall conform with the following:



The reset signal and start signal shall be relay contact input. Load capacity shall be 50V, 50mA or less.

[COMMENT 26]

1. The reset signal at external starting resets all operations other than at automatic calling.

2. Of the additional functions of the telemetering equipment, those given in item (1) below are wired or provided space at the time of delivery and may be added at the site after installation. However, addition and modification for the additional functions given in item (2) below at the site after installation is uneconomical, and may be installed in a separate bay from the standpoint of space, etc., depending on the contents.

   (1) Additional functions addable at the site after installation

      a. Connection to multiplex radio equipment

      b. Connection to wire gauging equipment

      c. Connection to monitoring equipment

      d. Connection to external interruption device

      e. Connection to operator console

   (2) Additional functions which must be provided for at the time of delivery

      a. Connection to a display unit

      b. Connection to an automatic gate control equipment

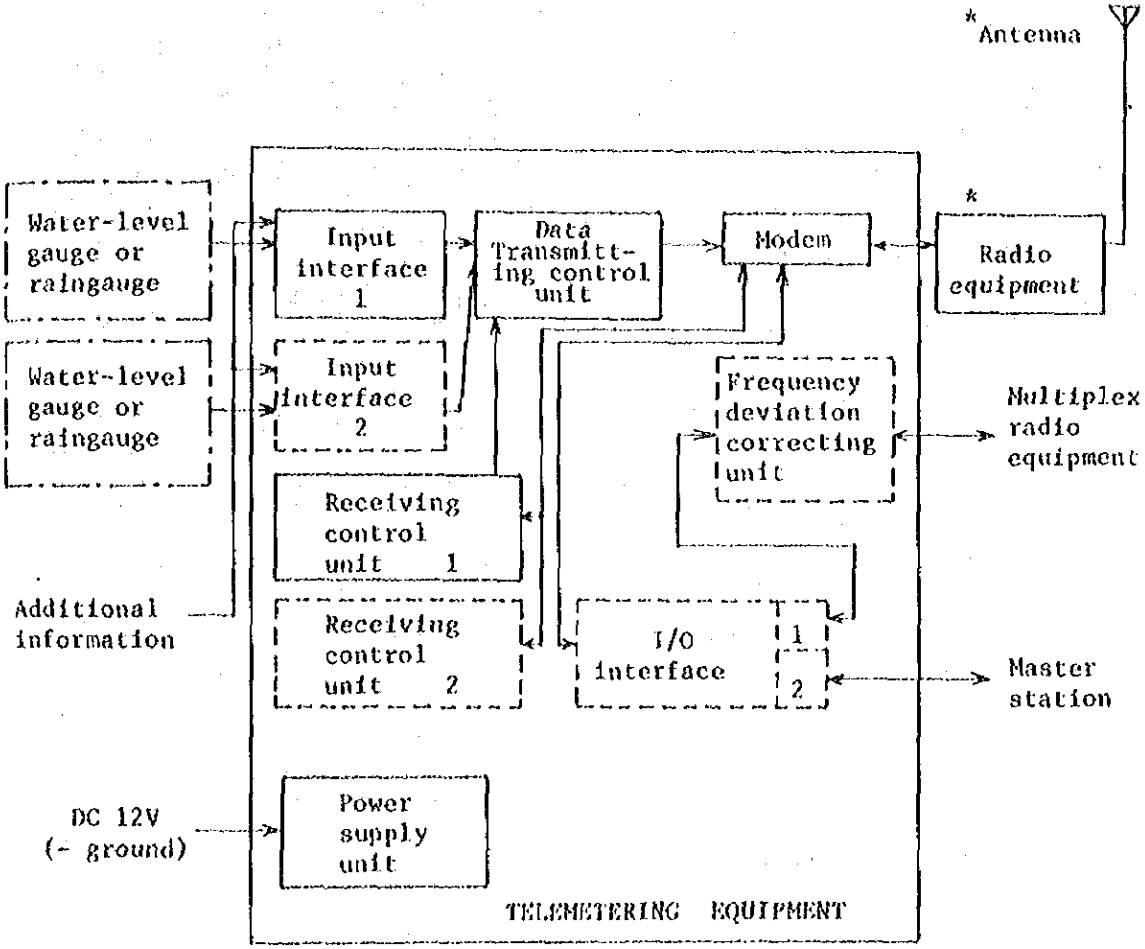
      c. Connection to other equipment

      d. Addition of repeater control function

3-2 (Gauging Station Equipment)

3-2-1 (Equipment composition)

1) The equipment composition of the gauging stations, including standard composition and optional functions, shall be as follows.



Legend : 1. * Not used when connected to multiplex radio equipment or directly to telemetering equipment.

2. [ ] Standard composition

3. [ ] Optional function

4. [ ] Equipments outside the scope of these specification.

2) Components shall be as follows:

	Name	Qnt'y	Remarks
1	Telemetering equipment	1	
- 1	Modem	1	
- 2	Data transmitting control unit	1	
- 3	Receiving control unit 1	1	
- 4	Input interface 1.	1	
- 5	Power supply unit	1	
- 6	Cabinet	1	
- 7	I/O interface	1	Optional function. Conforms with SSI.
- 8	Frequency deviation correcting unit	1	"
- 9	Receiving control unit 2	1	"
-10	Input interface 2	1	"
2	Radio equipment	1	Conforms with SSI.
3	Antenna equipment	1	Conforms with SSI.
- 1	Antenna	1	
- 2	Coaxial arrester	1	
4	Repeater control unit	1	Conforms with SSI.
5	Accessories		
- 1	Hand microphone	1	
- 2	Test cord	1	
- 3	Adjustment tools	1 set	
- 4	Instruction manual	1 copy	
- 5	Test data	1 copy	
- 6	Technical service card	1 copy	In card case
- 7	Accessory box	1	

3-2-2 (Functions and ratings)

1) Telemetering equipment

(1) Modem

This unit shall have a modulation function which converts pulse code to a frequency modulated signal, and a demodulation function which receives the gauging station calling signal.

(2) Transmitting control unit

This unit shall have a function which converts the input signals from the rain gauge and water-level gauge into a response signal.

(3) Receiving control unit 1

This unit shall perform frequency discrimination of the calling signal (2-frequency series signal) from the master station and provide an output to the transmitting control unit only when the unique frequency allocated to its own station has been received.
The number of stations controllable at this unit shall be 1, but addition of one more station shall be possible by SSI.

(4) Input interface 1

This unit shall be connected to the raingauge, water-level gauge, etc. and shall have a function which interface these devices to the transmitting control unit. The number of gauges connectable to this unit shall be one, as standard, but shall be expandable by one by SSI.

(5) Power supply unit

This unit shall supply the necessary power to each unit. Its input shall be DC12V (- ground).

(6) Others

a. The following operations shall be performed.

	Item	Remarks
1	Speech	Hand microphone, speaker, volume adjustment
2	Data code test transmission	
3	Transmitter input level	Measured by U-link
4	Receiver output level	"
5	Calling signal selection filter input level	Measured by U-link or check terminal
6	FS modulator input signal level	

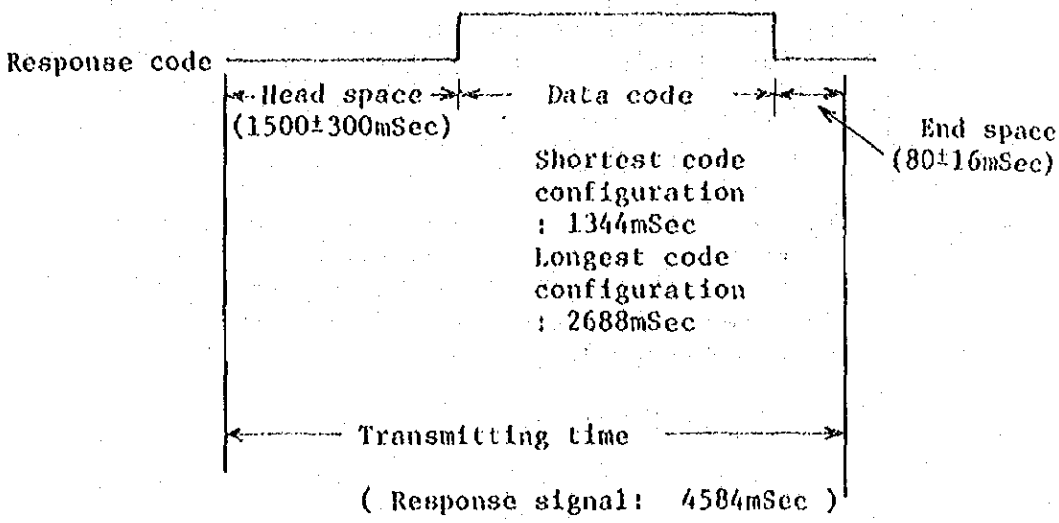
b. Protection circuit

A protection function that halts transmission after a fixed period of time to prevent the telemetering equipment from transmitting continuously because of

a failure in the transmitting control unit shall be provided.
This protection circuit shall have a time length of 6 ±1 seconds.

[COMMENT 27]

1. The setting time of the protection circuit is 4,584mSec as shown below, considering the maximum time of the response signal, but has been made 6,000 ±1,000mSec considering the setting accuracy.



2) Repeater control unit

This unit shall be installed at the telemetering equipment, and shall have a function which sends the repeating-start signal and repeating-stop signal.
It shall have a portable construction.
This unit is installed by specifying SSI.

[COMMENT 28]

The repeater control unit has a printed circuit board construction, and can be used by installing it at the telemetering equipment. Moreover, it may be easily carried by placing it in a special box.

3-2-3 (Additional functions)

The following functions may be added to the telemetering equipment by specifying SSI.

1) Receiving control unit 2

Reception of one more calling signal from master stations shall be possible by adding this unit.

2) Input interface 2

Connection of one more gauging quantity shall be possible by adding this unit. In this case, the station No. shall be given separately.

3-2-4 Gauging station equipment current consumption

The current consumption of the gauging station equipment shall satisfy the following ratings at 12.0V power supply voltage.

Item		Current consumption
Stand-by		15 mA or less
Receiving		150 mA or less
Transmitting	1 W	2.0 A or less
	3 W	2.5 A or less
	10 W	5.5 A or less

[COMMENT 29]

1. Note that the following current consumption are added when a water-level gauge is connected to the telemetering equipment.

(1) A water-level gauge current consumption of about 0.5A may be necessary when a water-level gauge is connected directly to the telemetering equipment.

(2) When the entry of the voltage induced from the outside into the telemetering equipment is considered, elimination of the induced voltage by inserting a relay circuit between the telemetering equipment and water-level gauge is necessary. In this case, the current consumption of the relay circuit is about 1.0A.

3-2-5 (Raingauge and water-level gauge connection conditions)

Connection of the telemetering equipment to a rainguage, water-level gauge, etc. which satisfy the following conditions shall be possible. However, the minimum detection units of the raingauge shall be 1mm, and the minimum detection units of the water-level gauge shall be 1cm.

1) Electrically connected raingauge, water-level gauge

(1) Output format : No-voltage make contacts (Closed by logic 1)

(2) Code format

a. Water-level gauge : BCD code with odd parity bit at each digit (maximum 4 digits).

b. Raingauge : BCD code with odd parity bit at each digit (maximum 3 digits). Or contact signal of every 1mm (1 pulse/mm).

[COMMENT 30]

1. The following conditions are satisfied by gauging equipment requiring a gauging command.

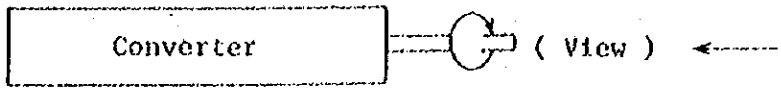
(1) Response time : Within 1 sec (Time from issuing of gauging command to transfer of data to telemetering equipment)

(2) Data : Data are continuous up to release of gauging command

2. Water-level gauging equipment connected mechanically

When connected to gauging equipment that does not output an electrical signal is added. Connection to this converter shall be mechanical connection.
The converter satisfies the following conditions:

Revolution of shaft	: 1 revolution/m
Torque	: 500 g.cm or less
Direction of rotation	: Clockwise as viewed from the shaft



3. Since connection of water-level gauge and raingauge to telemetering equipment employs the following system, consideration must be given to their installation.

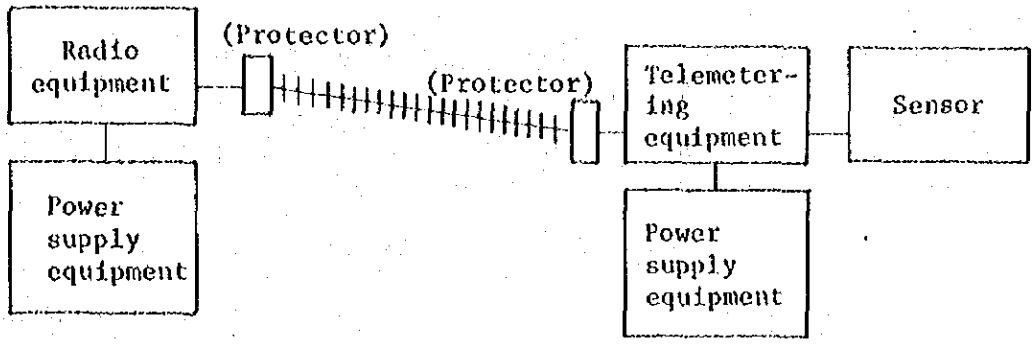
(1) Water-level gauge

Usually, A/D converter is installed in the water-level gauge to output electrical signal, which is converted to response signal at the telemetering equipment.
As there are various kinds of format in output of the water-level gauge, consideration must be given to it.

(2) Raingauge

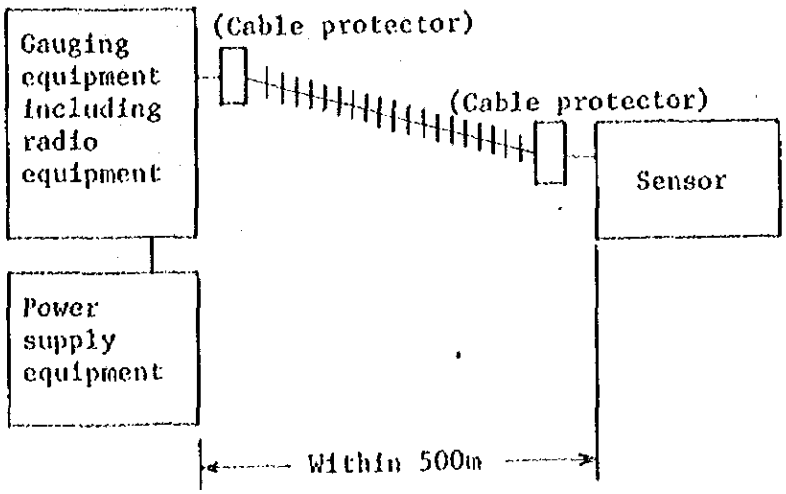
To obtain rainfall data, A/D converter is installed in the raingauge, or pulse counter, which counts 1 mm pulses from raingauge, is installed in the telemetering equipment.

4. In principle, the AC transmission system illustrated below (FS signal is desirable when the telemetering equipment and radio equipment are separated.



Connection cable: 0.9 ϕ cable, as standard.

However, the DC transmission system illustrated below may be used when unavoidable, but the distance between the telemetering equipment and gauging equipment (sensor) is limited to approximately 500m. Since this system is easily struck by lightning, its use should be avoided in areas where lightning occurs frequently.



Connection cable: 0.9 ϕ cable, as standard.

5. Careful attention must be given to lightning damage when the telemetering equipment and gauging equipment (sensor) are separated. Lightning countermeasures including the facilities inside the station building, such as the following, must be taken when installed in areas where lightning frequently occurs.

(1) In principle, installation of a lightning rod and surge absorb transformer and cable protector, etc.

(2) Series connection of every groundings.

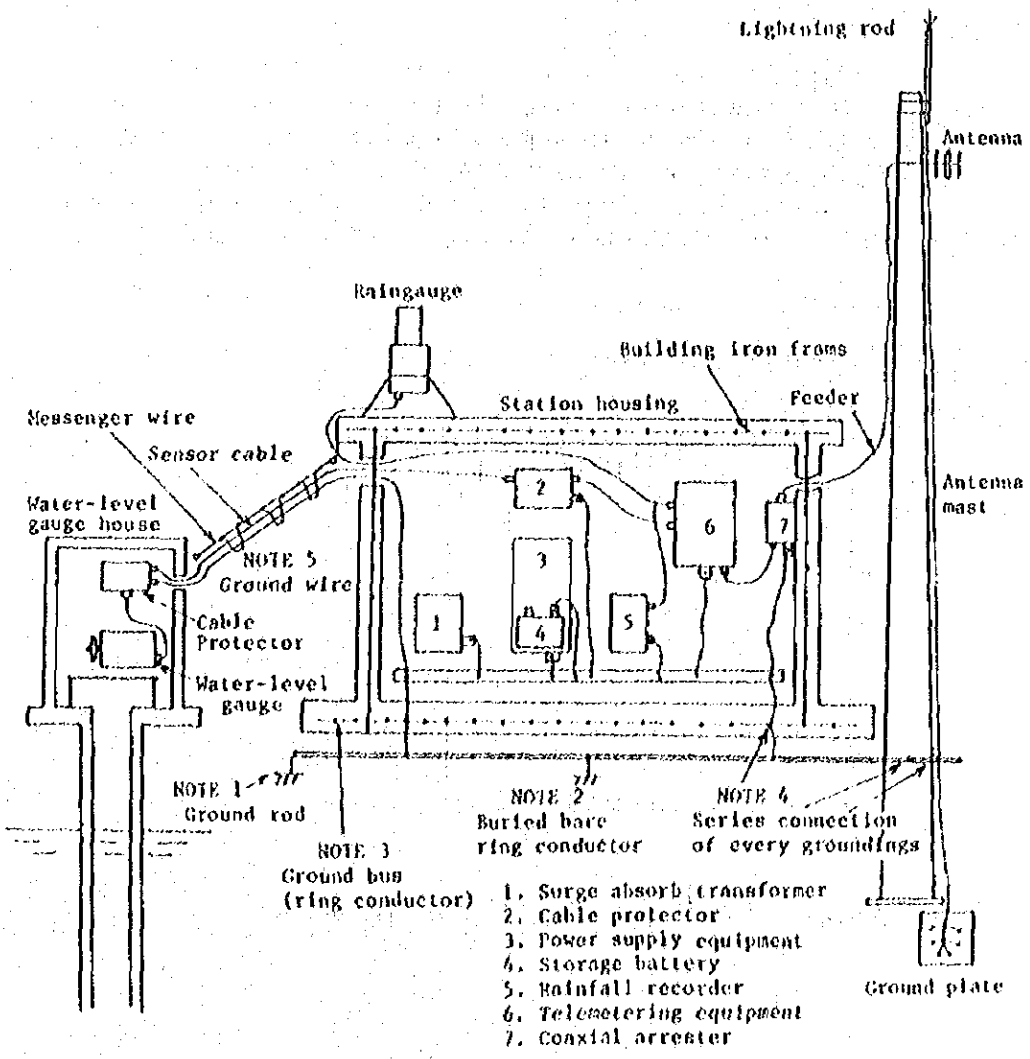
(3) Installation of ring conductors inside and around the station housing.

(4) Connection of structures inside the compound (iron tower, equipment, etc.) to the nearest ring conductor.

(5) In principle, ground wire shall be 14mm^2 or larger copper wire, and connections shall be by telmit welding.

(6) A target value of grounding resistance shall be 50Ω or less.

(7) Example of grounding facilities of a gauging station is shown below.



NOTE 1 Ground rod

The number of rods is increased according to the grounding resistance by driving rods (1.5m) into the ground at intervals of 3m or more, or a grounding resistance reducing agent is used.

NOTE 2 Buried bare ring conductor

The various ground electrodes, etc. are connected.
The wire is bare conductor of about $22^{\square}$, and grounding resistance reducing agent is used, as required.

NOTE 3 Ground bus (ring conductor)

The ground points of each facility inside the housing are connected in common.

NOTE 4 Series connection of every groundings

The various grounds and conductors and equipment installed in the same compound are connected in series by conductor of the necessary thickness.

NOTE 5 Ground wire

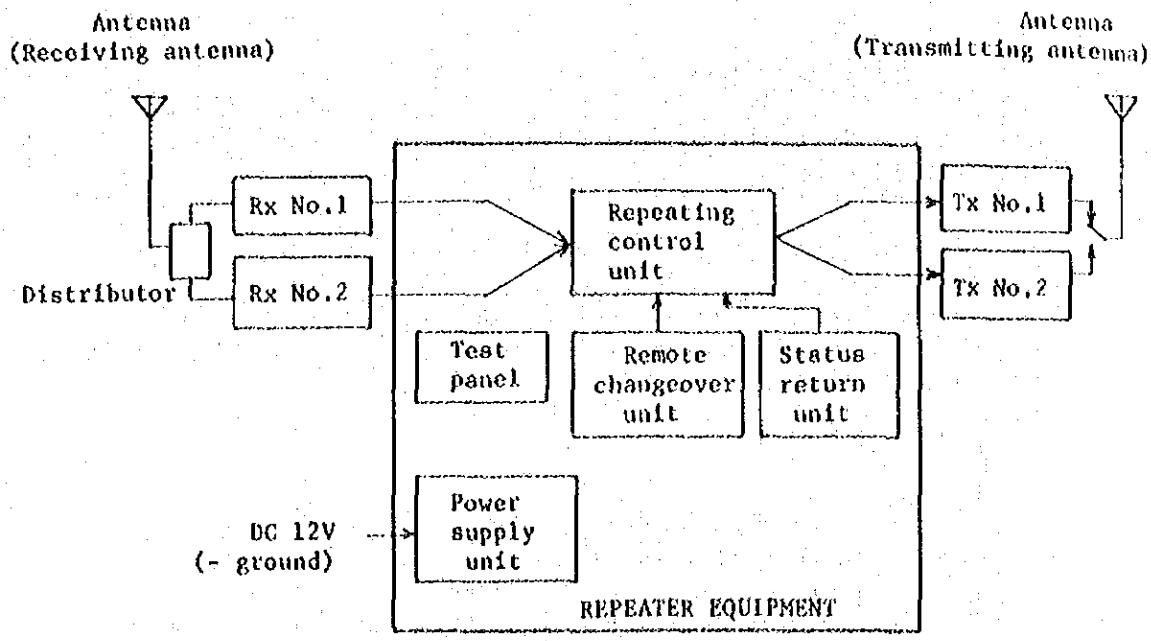
Ground wire is laid when necessary grounding resistance cannot be obtained at the water-level gauge installation site.
When the water-level gauge is separated from the station housing, a cable protector is installed and a separate ground cable of $14^{\square}$ or greater is laid and connected to the other ground wire.

3-3 (Repeater Station Equipment)

3-3-1 (Equipment composition)

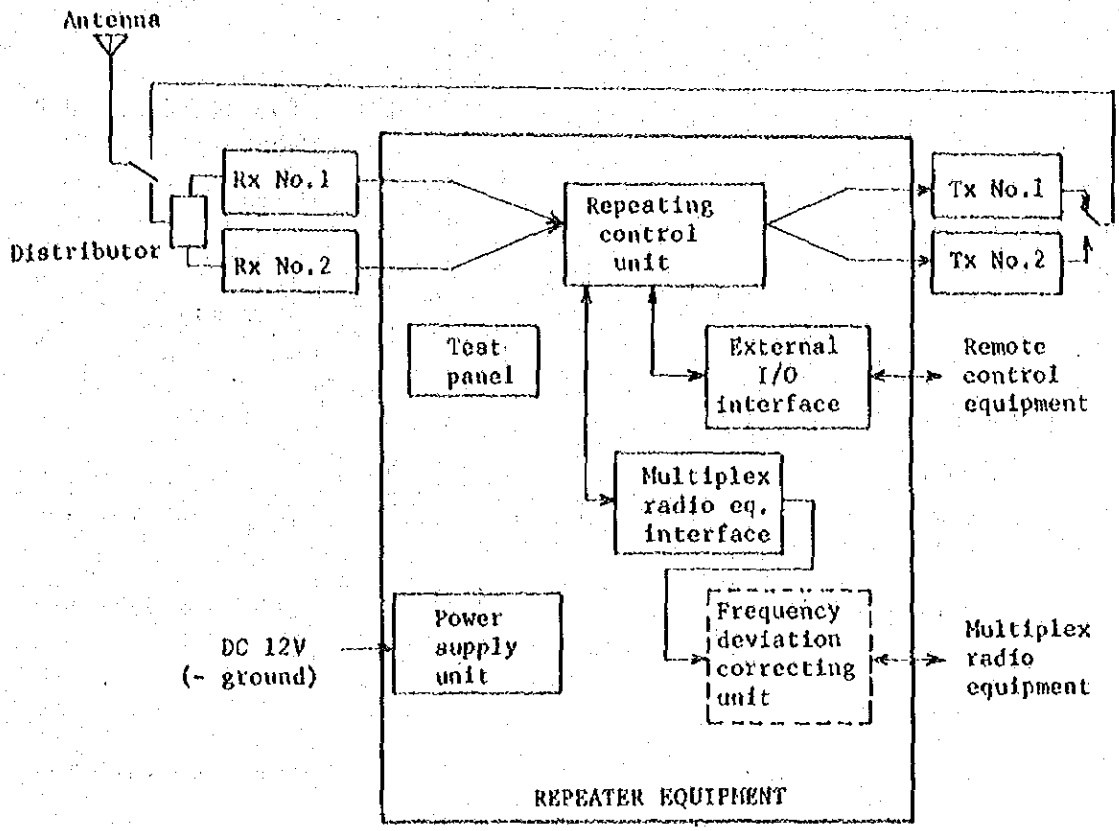
1) The repeater station equipment, including the standard composition and optional functions, shall be as follows.

(1) For V-V repeater



Legend : 1. ☐ Standard Composition

(2) For μ-V repeater



Legend : 1. ▭ Standard composition

2. ▭ Optional function

2) Components shall be as follows:

	Name	Qnt'y	Remarks
1	Repeater equipment	1	
- 1	Repeating control unit	1	
- 2	Remote changeover unit	1	Installed for V-V repeating
- 3	Status return unit	1	"
- 4	Test panel	1	
- 5	External I/O interface	1	Installed for μ-V repeating
- 6	Multiplex radio eq. interface	1	"
- 7	Power supply unit	1	
- 8	Bay/Cabinet	1	
- 9	Frequency deviation correcting unit	1	Optional function
2	Radio equipment	1	Conforms with SSI.
- 1	Transmitter	2	
- 2	Receiver	2	
3	Antenna equipment	1	Conforms with SSI.
- 1	Antenna	1	
- 2	Distributor	1	Installed at repeater equipment
- 3	Filter	1	Conforms with SSI.
- 4	Coaxial arrester	1	
4	Accessories	1 set	
- 1	Test cord	1	
- 2	Adjustment tools	1 set	
- 3	Hand microphone	1	
- 4	Instruction manual	1 copy	
- 5	Test data	1 copy	
- 6	Technical service card	1 copy	In card case
- 7	Accessory box	1	

3-3-2 (Functions and ratings)

1) Repeater equipment

(1) Repeat control unit

This unit shall perform the receiver output repeating operation, and receiver failure detection and automatic changeover by transmitter failure.

(2) Remote changeover unit

This unit shall be equipped at V-V repeating, and shall permit changeover of the transmitters by control signal from the master station.

(3) Status return unit

This unit shall be equipped at V-V repeating, and shall return the status of the repeater equipment to the master station. This unit shall use the telemetering equipment, and shall convert the repeater information to numbers and transmit it to the master station.
However, in this case, repeater information shall be handled as one gauging station, and conversion of numerics shall be as follow.

Item	1,000 digit	100 digit	10 digit	1 digit
Transmitter No. 1 working	1			
Transmitter No. 2 working	2			
No transmitter failure		0		
Transmitter No. 1 failure		1		
Transmitter No. 2 failure		2		
No receiver failure			0	
Receiver No. 1 failure			1	
Receiver No. 2 failure			2	

Station No.; Station No. given to repeater station.

Additional information; Shall be 1 digit
(power supply information)

[COMMENT 31]

1. Since the repeater information which should be transmitted from the repeater station to the master station covers many items, the signal transmission system has been made the same as that of the gauging station.

Moreover, if the same equipment as that of the gauging station equipment is installed as the repeater status return unit, this system is employed to simplify the processing method at the master station because the same maintenance as the telemetering equipment is possible and the signal format is the same.

2. Repeater information typeout example

DATE	TIME	Station A	Station B	Repeater station
02 18	12 00	1234 +	2345 +	1020 +

NOTES: (1) The above is an example when the repeater station has been allocated to the 3rd station.

(2) Transmitter No.1 working no transmitter failure, receiver No.2 failure and power normal is illustrated above.

(4) Test panel

The following functions shall be provided at the test panel for system monitoring and maintenance at the repater equipment.

	Function	Operation	Display	Remarks
1	Power ON/OFF	O	-	
2	Transmitting display	-	O	
3	Speech	O	-	
4	Repeating-start	O	-	V-V repeating only
5	Repeating-stop			
6	Transmitter No. 1 working	O	O	Including changeover operation
7	" 2 "			
8	" 1 failure	-	O	
9	" 2 "	-	O	
10	Receiver No. 1 failure	-	O	
11	" 2 "	-	O	
12	Display OFF	O	-	May be replaced by door switch.
13	Transmitter changeover lock	O	-	
14	Receiver No. 1 disconnect	O	-	
15	" 2 "	O	-	

(5) External I/O interface

This unit shall be installed at μ-V repeating, and shall satisfy the following conditions.

a. Input conditions

a) Shall be relay contact input.

b) Shall close the contact by logic 1. Load capacity shall be 50V, 50mA or greater.

c) Signal length shall be 200 ±100mSec.

d) Kinds of control items

(a) Transmitter changeover No. 1 → No. 2

(b) " No. 2 → No. 1

(c) Receiver No. 1 disconnect

(d) Receiver No. 2 disconnect

(e) Receiver parallel connection

b. Output conditions

a) Shall be relay contact output.

b) Shall close the contact by logic 1.
Load conditions shall be 50V, 50mA or less.

c) Kinds of output signals

(a) Transmitter No. 1 working

(b) Transmitter No. 2 working

(c) Receiver No. 1 failure

(d) Receiver No. 2 failure

(e) Transmitter No. 1 failure

(f) Transmitter No. 2 failure

(6) Multiplex radio eq. interface

This unit shall be equipped for μ-V repeater equipment and shall have a function that connects multiplex radio equipment and shall satisfy the following input/output conditions.

a. I/O level Settable over 0 ∿ -25dBm range

b. I/O inpedance 600Ω ±20% balanced

(7) Power supply unit

This unit shall supply the necessary power to the other units. Its input shall be DC 12V (- ground).

3-3-3 (Repeater equipment current consumption)

The current consumption of the repeater station equipment shall satisfy the following conditions at 12.0V power supply voltage.

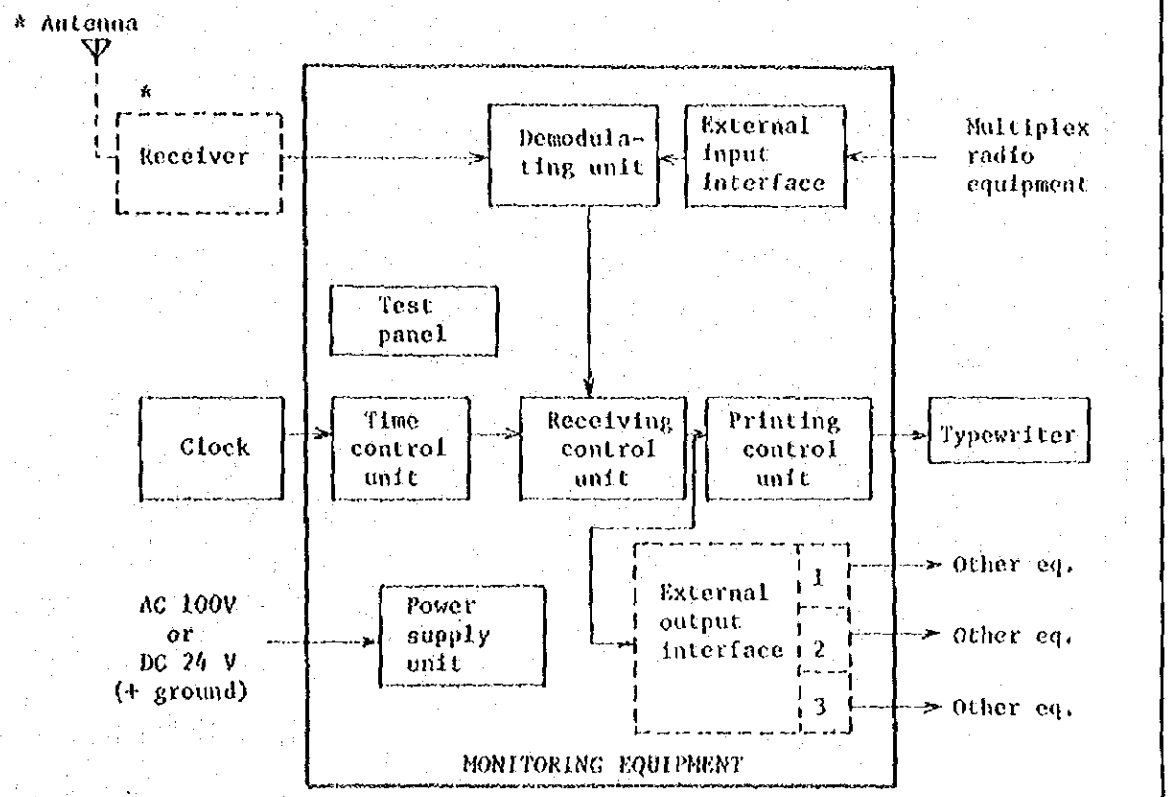
Item		Current consumption
Stand-by		50 mA or less
Receiving		1.3 A or less
Repeating	1 W	3.0 A or less
	3 W	3.5 A or less
	10 W	4.7 A or less

However, the current consumption at repeating shall increse 1.0A at status return unit operation (for V-V repeater).

3-4 (Monitoring station Equipment)

3-4-1 (Equipment composition)

1) The equipment composition of the monitoring station, including standard composition and optional functions, shall be as follows:



Legend : 1. * Not used when connected to multiplex radio equipment.

2. [ ] Standard composition

3. [ ] Optional function

[COMMENT 32]

Monitoring performed by connection to multiples radio equipment shall be the standard composition, and antenna equipment and receiver shall be inatalled as optional functions in the case of a simplex radio link.

2) Components shall be as follows:

	Name	Qnt'y	Remarks
1	Monitoring equipment	1	
- 1	Demodulating unit	1	
- 2	Receiving control unit	1	
- 3	Printing control unit	1	
- 4	External input interface	1	
- 5	Test panel	1	
- 6	Time control unit	1	
- 7	Power supply unit	1	
- 8	Bay	1	
- 9	External output interface	1	Optional function
2	Typewriter	1	Same as para. 3-1-2 3)
3	Receiver	1	Conforms with SSI.
4	Antenna equipment	1	Conforms with SSI.
- 1	Antenna	1	
- 2	Coaxial arrester	1	
5	Clock	1	Conforms with SSI.
6	Accessories	1 set	
- 1	Test cord	1	
- 2	Adjustment tools	1 set	
- 3	Instruction manual	1 copy	
- 4	Test data	1 copy	
- 5	Technical service card	1 copy	In card case
- 6	Accessory case		

3-4-2 Functions and specifications

1) External input interface

This unit is used to connect to multiplex radio equipment. Its input conditions shall satisfy the following specifications.

(a) Input level — Settable over the 0 ∿ -25dBm range

(b) Input impedance — 600Ω ±20% balanced

2) Monitoring equipment

(1) Test panel

At the monitoring equipment, the following functions shall be provided at the test panel for system monitoring and maintenance.

	Function	Operation	Display	Remarks
1	Resetting	0	-	For operation resetting
2	Buzzer off	0	-	
3	Receiving tone monitor	-	0	
4	Input level measurement	0	-	U-link, etc. (By external measuring instrument)
5	Lamp test	0	-	
6	Typewriter printing ON/OFF	0	-	
7	Squelch adjustment	0	-	When receiver equipped
8	Data bit display	-	0	
9	Burn out fuse	-	0	
10	Power ON/OFF	0	-	
11	Power	-	0	
12	Monitoring by voltmeter	0	0	For power supply voltage measurement

3-4-3 (Optional functions)

The following functions shall be addable to the monitoring equipment by specifying SSI.

1) External output interface

This unit is used to connect to a display unit, etc. Its output shall satisfy the following conditions.

(1) Shall be no-voltage contact.

(2) Shall close the contact by logic 1.
Load conditions shall be 50V, 50mA or less.

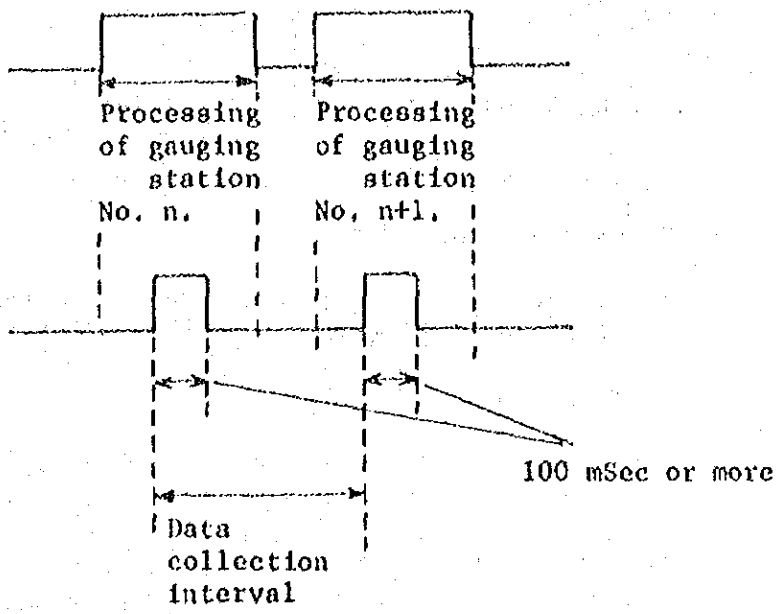
(3) Kinds of output signals

a. Output format

Output signal name	Output signal contents	Signal format	Remarks
Measured value	BCD 4 digits 20 bits	Momentary signal	With 1 bit odd parity at each digit
Station No.	BCD 2 digits 10 bits	do.	do.
Current time	BCD 4 digits 13 bits	Continuous signal	Without parity bit
1 minute pulse	1 bit	do.	
Monitoring	1 bit	do.	
Monitor station power abnormal	1 bit	do.	
Strobe		Monentary signal	

1. Data guarantee time

When data (momentary signal) are output to the outside, it shall conform with the following time chart.



{COMMENT 33}

1. The number of output paths shall be up to a maximum of 3 paths. The number of paths equipped must be specified by SSI.

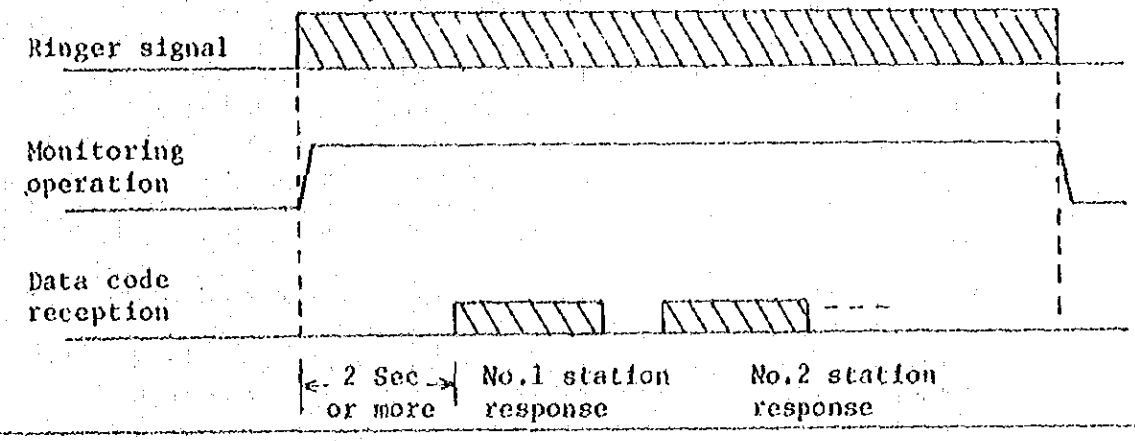
2. The kinds of output signals must be selected and specified by SSI after an adequate study of the connected devices.

3-4-4 (The conditions of monitoring operation)

The monitoring operation start condition and stop condition shall conform with one of the followings.

1) When monitoring is performed by simplex radio links, the monitoring operation shall be started by detection of the subcarrier when the response signal has been directly input from the gauging station and shall be ended by the timer after one series of operations is completed.

2) When monitoring is performed by multiplex radio links, the monitoring operation signal (ringer signal) sent by the master station shall be received, and the monitoring operation shall be performed only while this signal is being received.
The operation time chart for this system shall conform with the following.



[COMMENT 34]

1. Monitoring by simplex radio links conforms with the system that starts operation by detection of the subcarrier.

2. When a ringer signal can be used in a monitoring system by multiplex radio links, monitoring by means of this signal is desirable. However, when the ringer signal cannot be used, monitoring should conform with the above.

3-4-5 (Data processing)

1) When the monitoring operation is started by inputting the response signal directly by means of a simplex radio link, all the data shall be printed at both all-station calling and individual station calling.

2) When the monitoring operation is started by the ringer signal

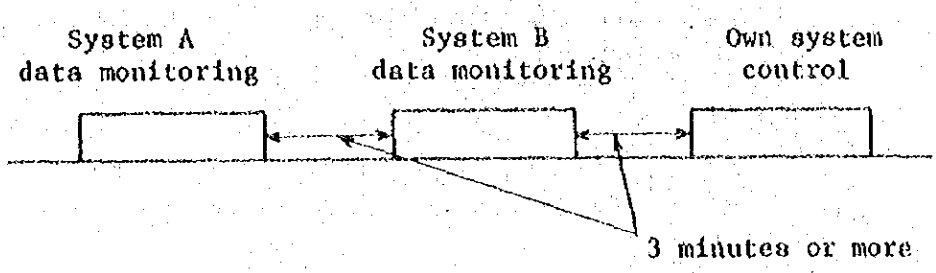
of multiplex radio link, only the data code of the gauging station received while the ringer signal is being received shall be printed.

3) The monitoring operation shall be performed from the lower gauging station number to the higher gauging station number, and printing shall not be performed when the station numbers are reversed during one monitoring operation.

3-4-6 (System expansion function)

1) The number of monitoring systems connectable to this equipment shall be a maximum of two systems.

2) The functions of master station shall be addable to this equipment as required.
In this case the operating time chart shall conform with the following, and the order of each system shall be specified in the SSI.

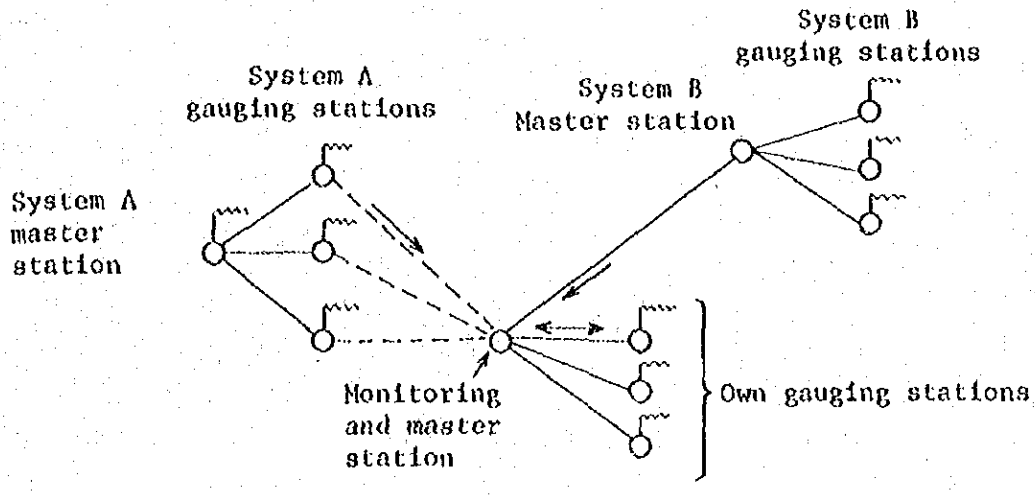


3) The total number of gauging stations of the monitoring system and own system shall be within 30 stations.
The station numbers in this case shall be one series of numbers for the entire system, and shall be assigned in calling order from low station number to high station number.

4) Printing shall be performed in one line for the entire system.

[COMMENT 35]

1. The transmission lines that can be connected to the monitoring/telemetering equipment of these specifications shall be up to a maximum of 3 transmission lines by combining simplex radio links, multiplex radio links, and wire links.
A system example is given below. (A repeater station may also be installed in the links, but is omitted here.)



2. In the system example given above, time management is performed perfectly and all stations can be assumed to be controlled by a single master station.
   As an example of time management, if time management is performed by the clock of each station, the interval of each system (data interval) must be about 3 minutes, considered from the stand point of clock accuracy.

3. Since processing is performed by station number, there must not be stations having the same station number, including the station numbers of the own system gauging stations.

PROFILE MAP

Note : The altitude scale shall be multiplied by 1/4 or 4, as the distance is plotted in half or double scale.

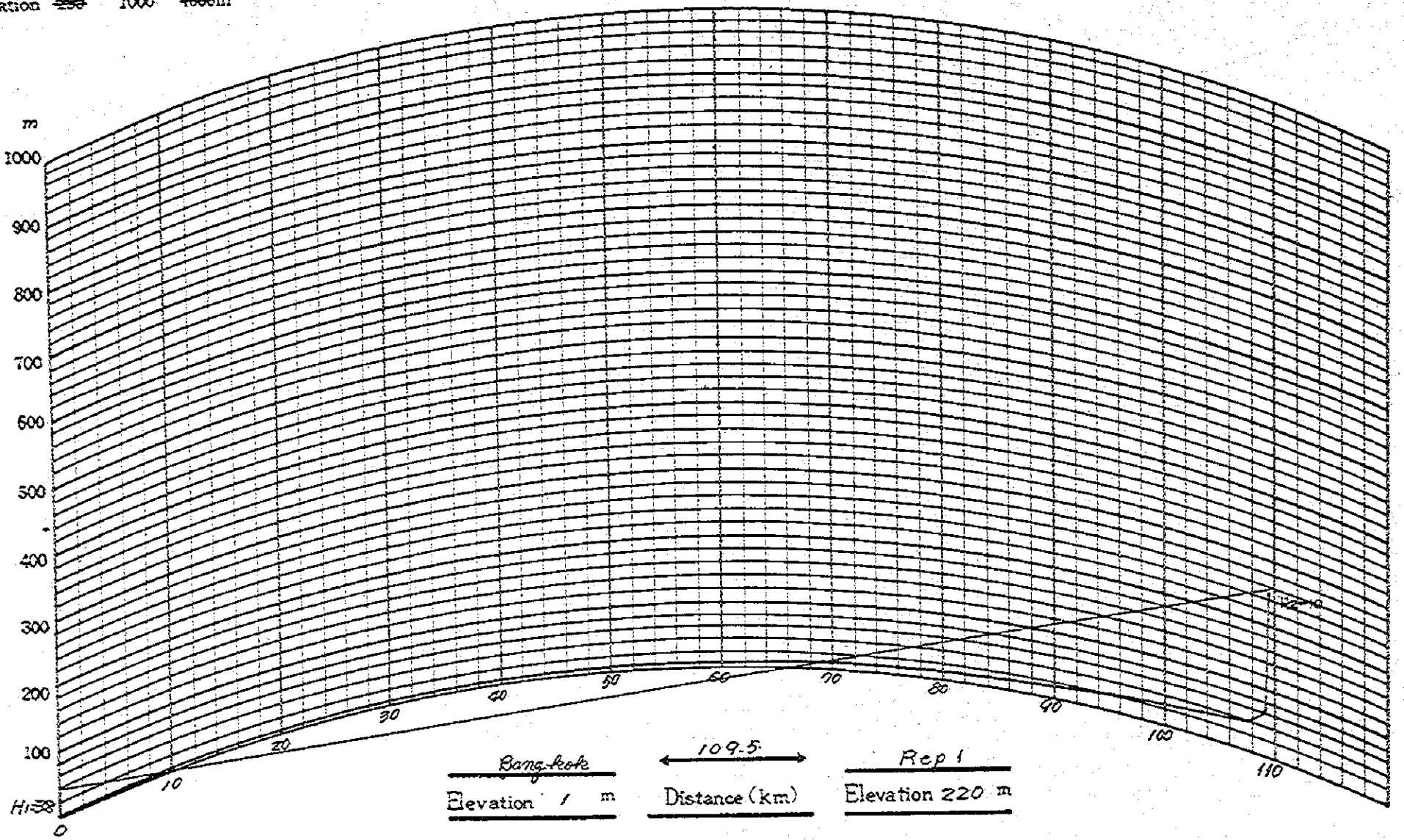
Distance ~~60~~ 120 ~~240~~km

Elevation ~~250~~ 1000 ~~4000~~m

PROFILE MAP (*/3 Radius)

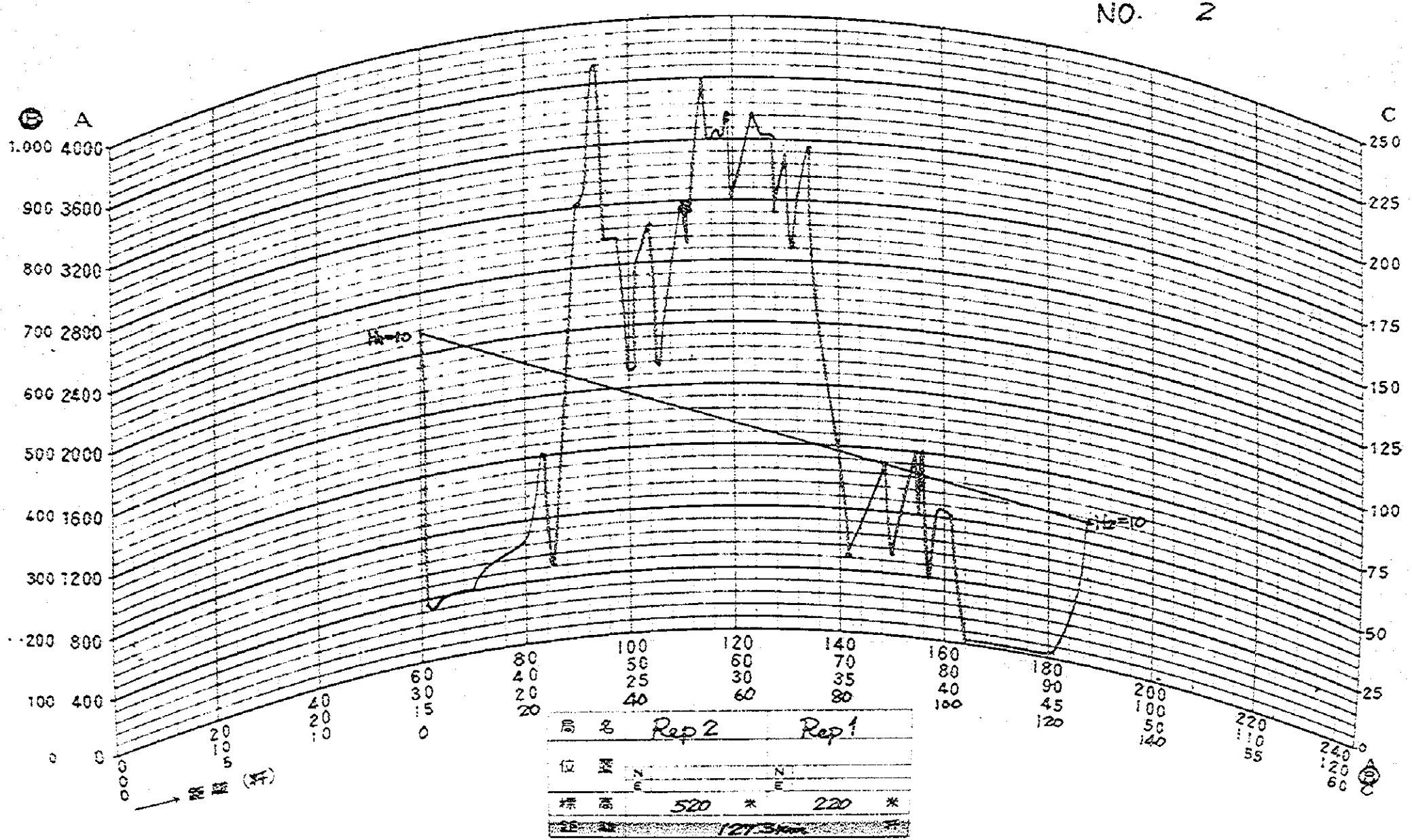
NO. /

DATE -



見 透 圖

NO. 2


A
C
B
1.000 4000
900 3600
800 3200
700 2800
600 2400
500 2000
400 1600
300 1200
200 800
100 400
0 0
250
225
200
175
150
125
100
75
50
25
0
20 10 5
40 20 10
60 30 15 0
80 40 20 20
100 50 25 40
120 60 30 60
140 70 35 80
160 80 40 100
180 90 45 120
200 100 50 140
220 110 55
240 120 60
Rh=10
Rh=10
局名 Rep 2 Rep 1
位置
標高 520 * 220 *
距離 (米)

Note : The altitude scale shall be multiplied by 1/4 or 4, as the distance is plotted in half or double scale.

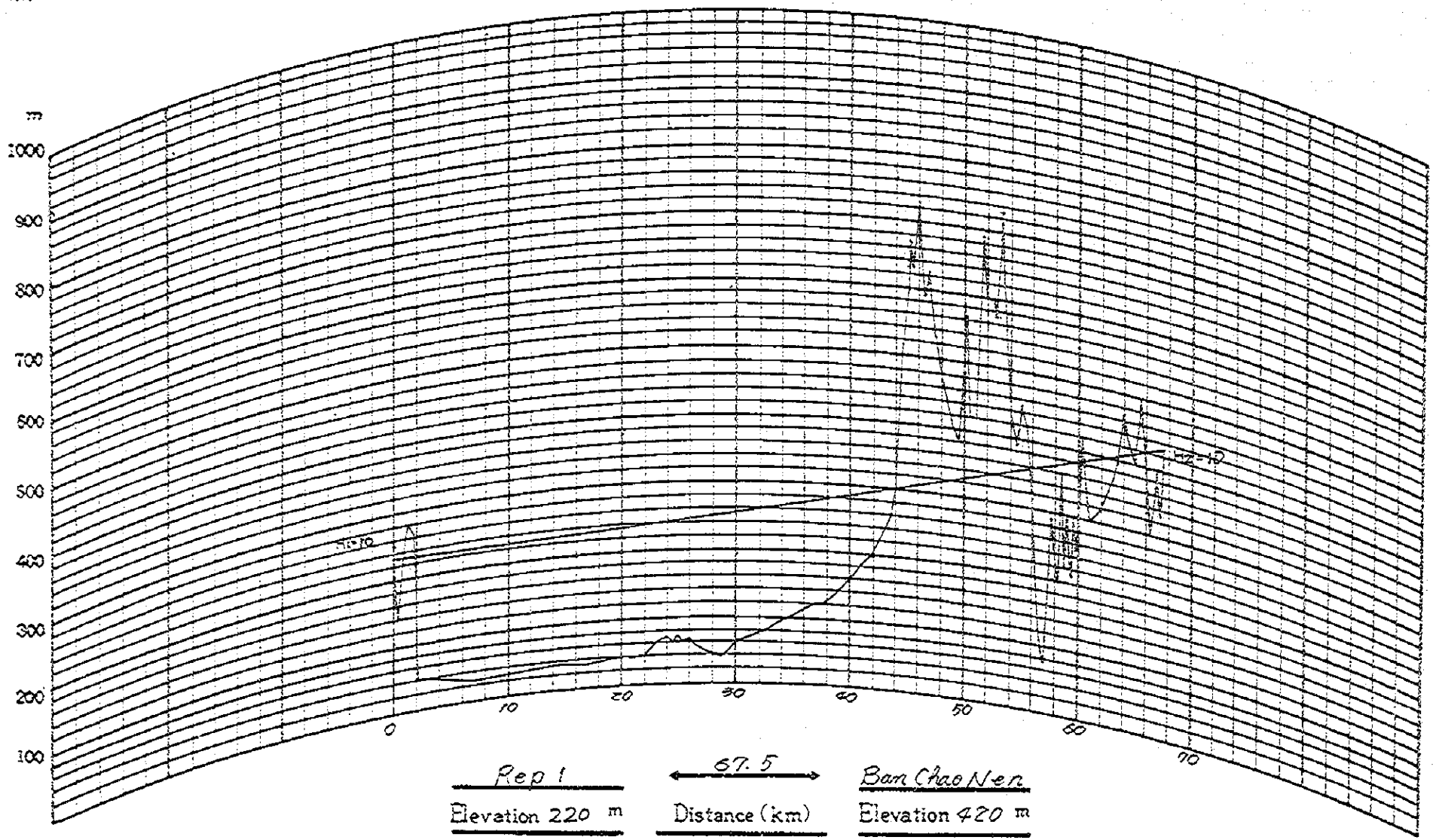
Distance ~~60~~ 120 ~~240~~km

Elevation ~~250~~ 1000 ~~4000~~m

PROFILE MAP (1/3 Radius)

NO. 3

DATE



Rep 1 — Elevation 220 m

67.5 — Distance (km)

Ban Chao Nen — Elevation 420 m

Note : The altitude scale shall be multiplied by 1/4 or 4 as the distance is plotted in half or double scale.

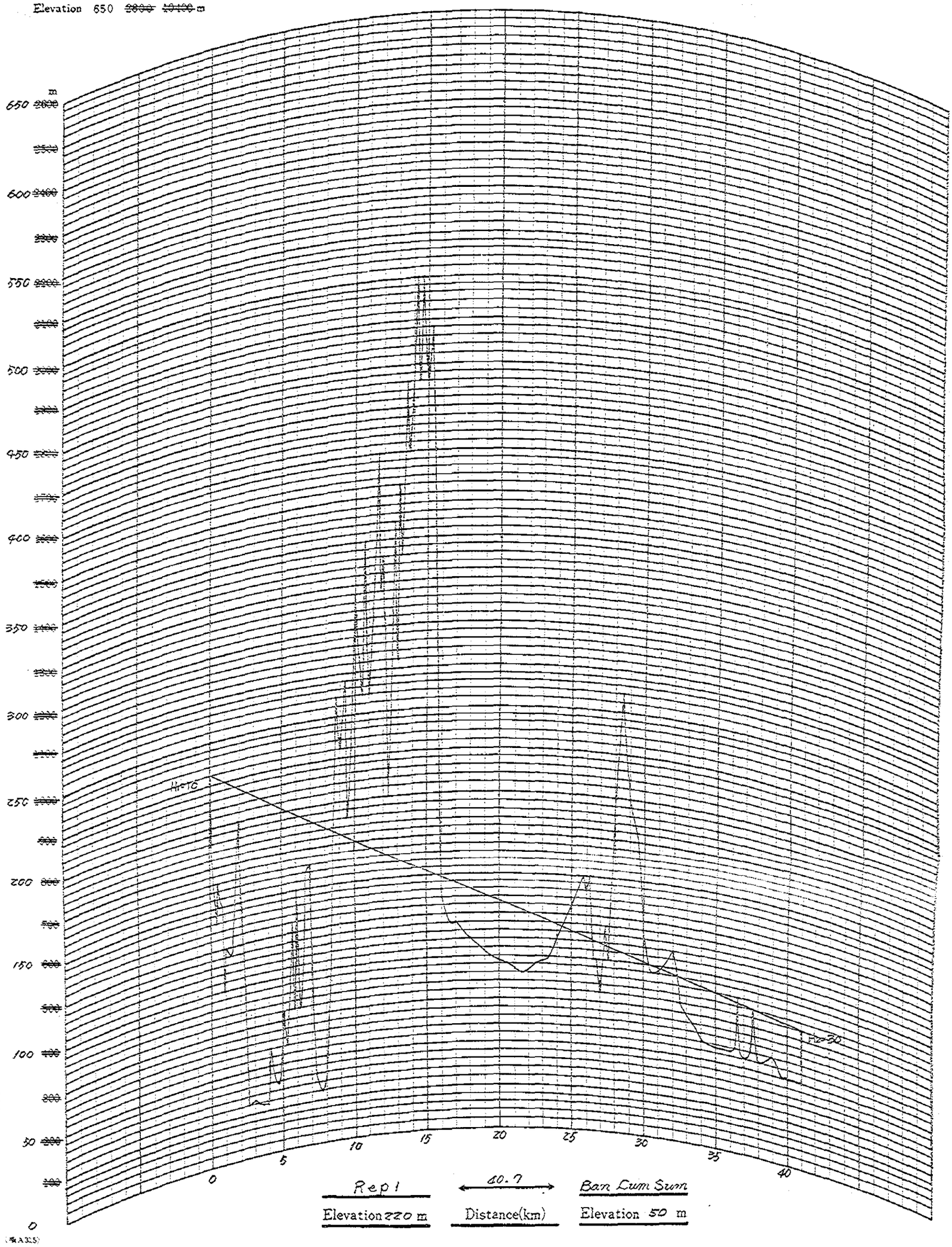
Distance 60 ~~[illegible]~~ ~~[illegible]~~ km

Elevation 650 ~~2800~~ ~~10100~~ m

PROFILE MAP (4/3 Radius)

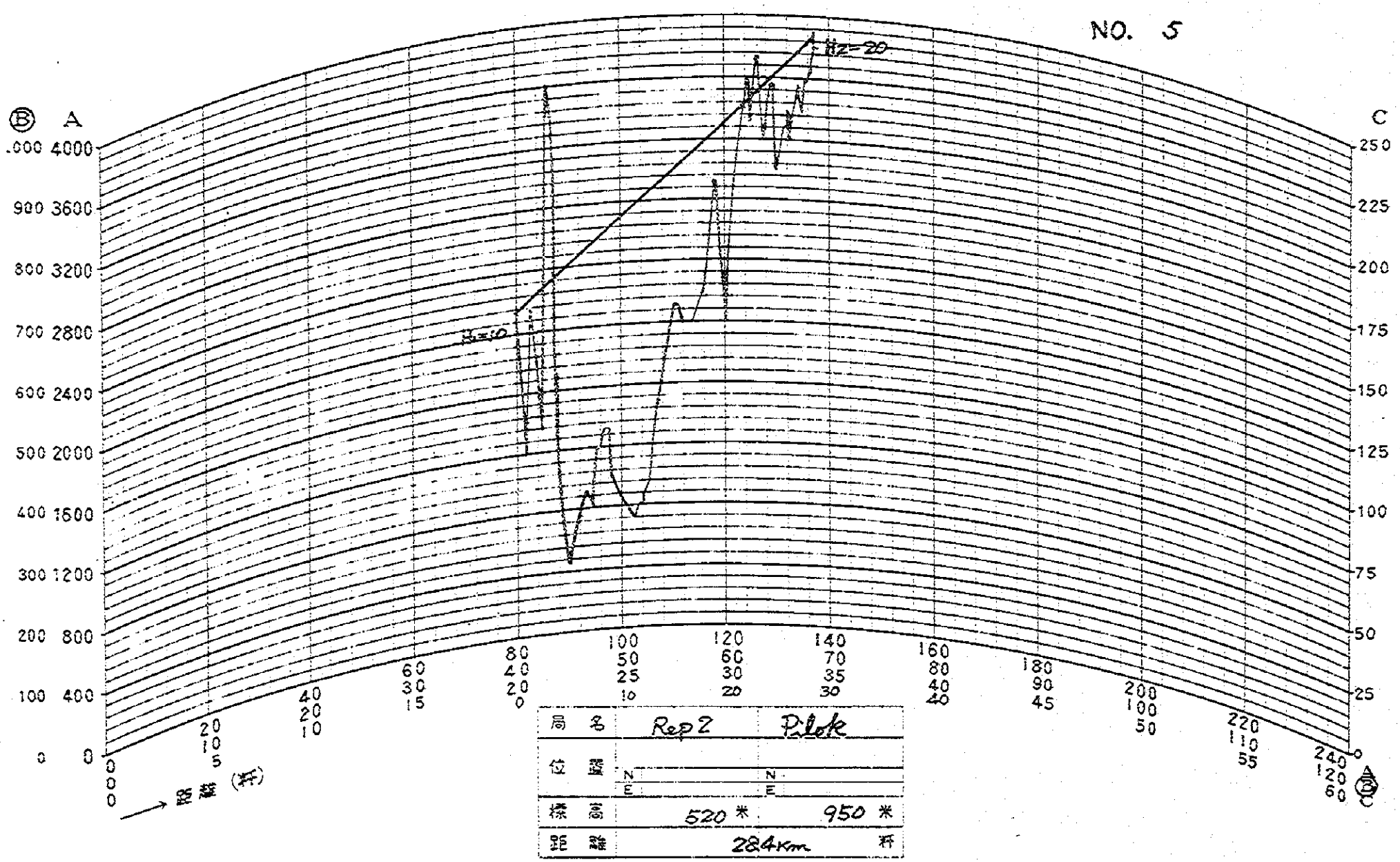
NO. 4

DATE



(ฟ.A 33.5)

NO. 5


Ⓑ A
C
Hz=20
H=10
.000 4000
900 3600
800 3200
700 2800
600 2400
500 2000
400 1600
300 1200
200 800
100 400
0 0
250
225
200
175
150
125
100
75
50
25
0
0 0 0
20 10 5
40 20 10
60 30 15
80 40 20 0
100 50 25 10
120 60 30 20
140 70 35 30
160 80 40 40
180 90 45
200 100 50
220 110 55
240 120 60
距離 (粁)
局名 Rep 2 Pilok
位置 N E N E
標高 520 米 950 米
距離 284Km 粁

JIS A4

No. _____

Note : The altitude scale shall be multiplied by 1/4 or 4, as the distance is plotted in half or double scale.

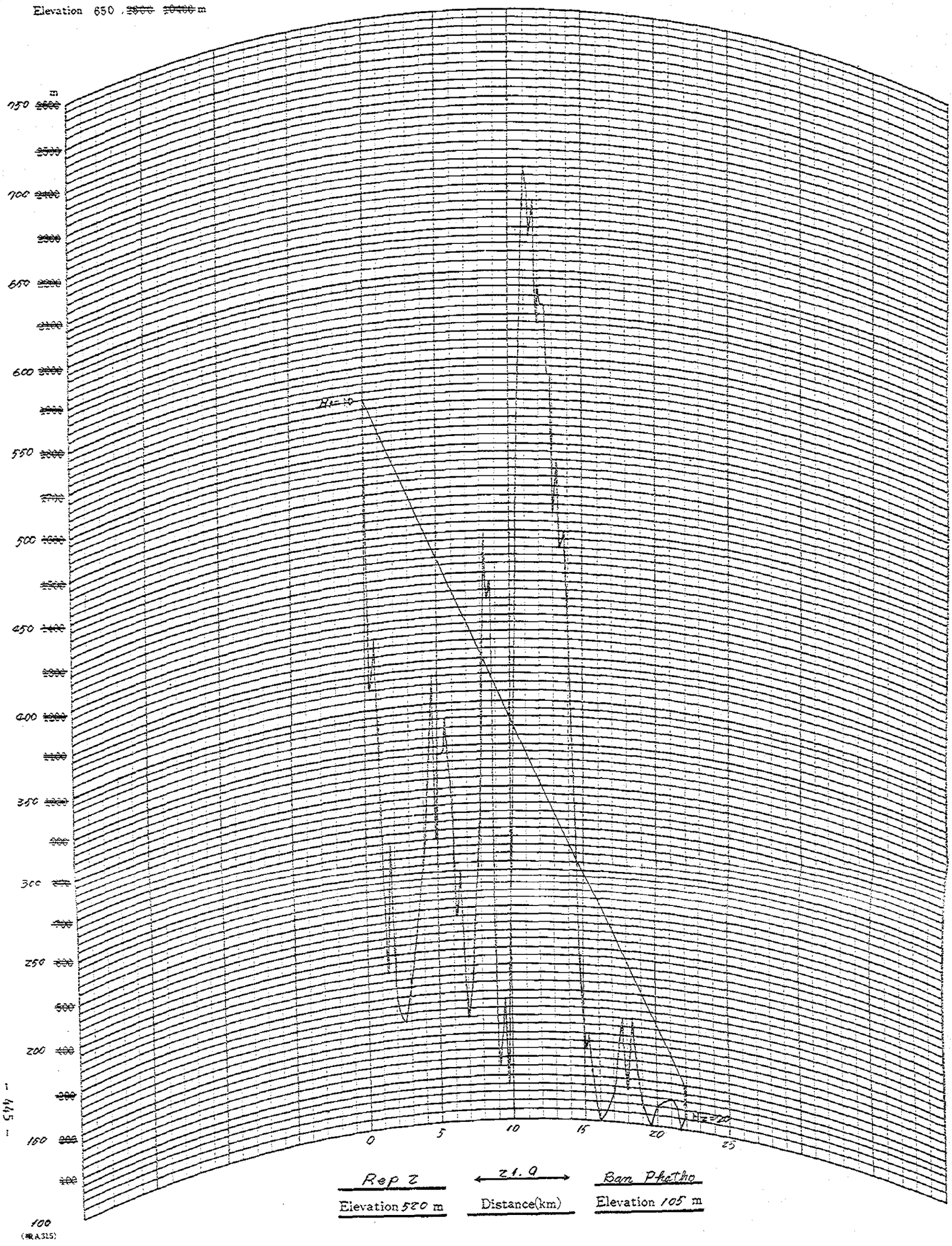
Distance 60 ~~120~~ ~~240~~ km

Elevation 650 ~~2600~~ ~~10400~~ m

PROFILE MAP (4/3 Radius)

NO. 6

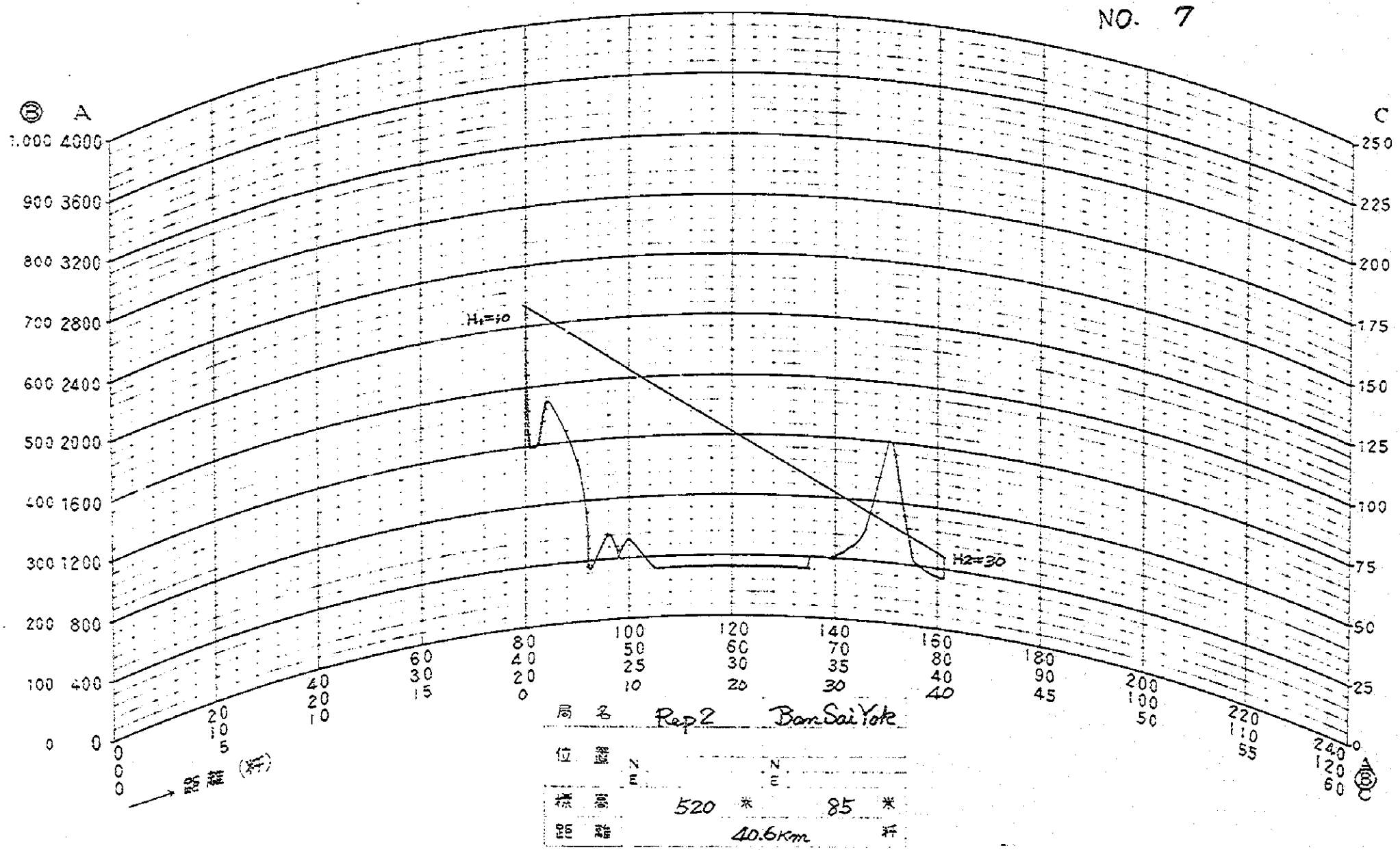
DATE



Rep 2 ⟷ 21.9 Ban Phetho

Elevation 520 m Distance(km) Elevation 105 m

NO. 7


Ⓑ A
C
H1=10
H2=30
局名 Rep2 BanSaiYok
位置 N E N E
標高 520 米 85 米
距離 40.6Km 粁
距離 (粁)

JIS A4

No.

Note : The altitude scale shall be multiplied by 1/4 or 4, as the distance is plotted in half or double scale.

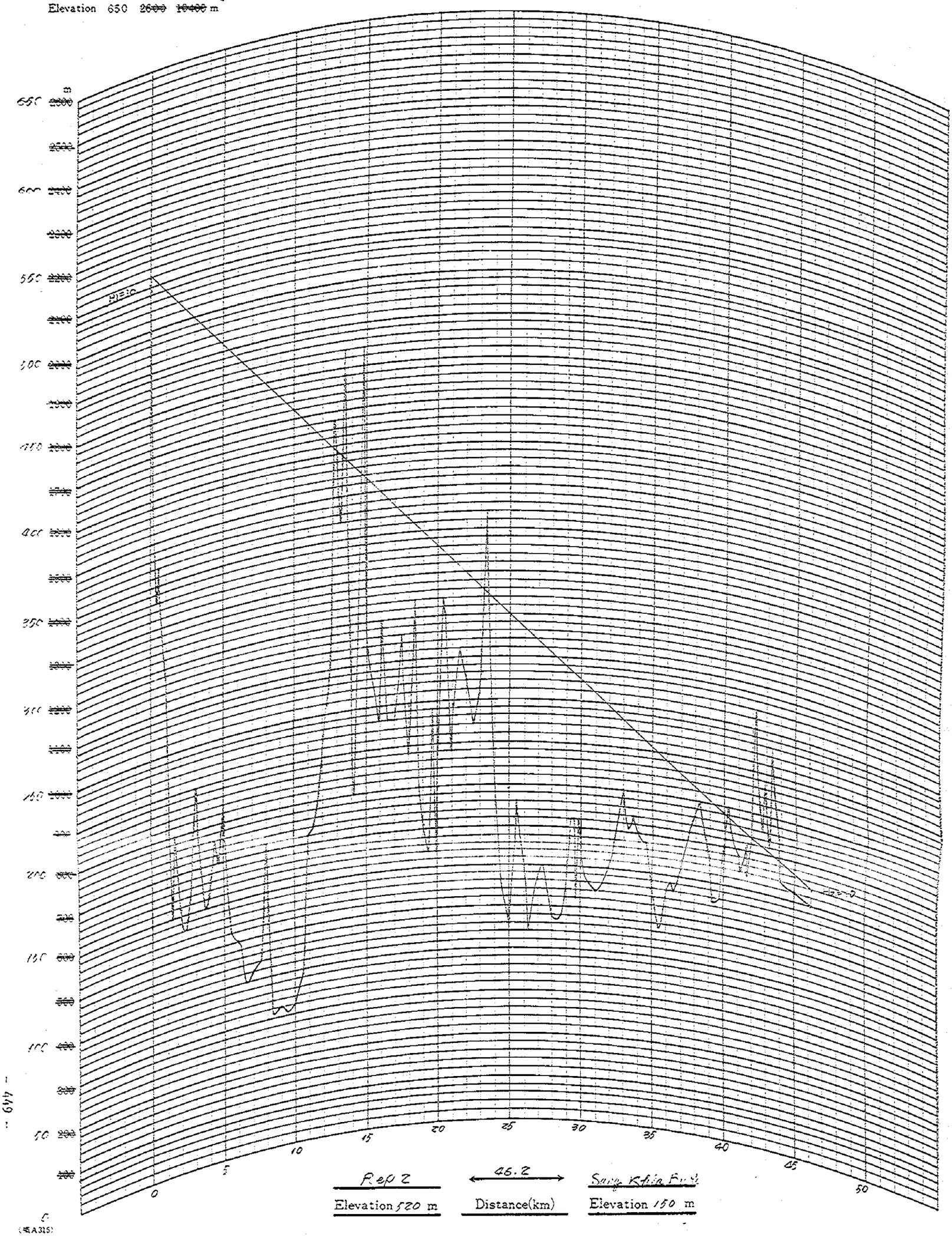
Distance 60 ~~120~~ ~~240~~ km

Elevation 650 ~~2600~~ ~~10400~~ m

PROFILE MAP ($^4/_3$ Radius)

NO. 8

DATE



Rep 2 — 46.2 — Sang. Khia Fm.

Elevation 520 m — Distance(km) — Elevation 150 m

(※A315)

Note : The altitude scale shall be multiplied by 1/4 or 4, as the distance is plotted in half or double scale.

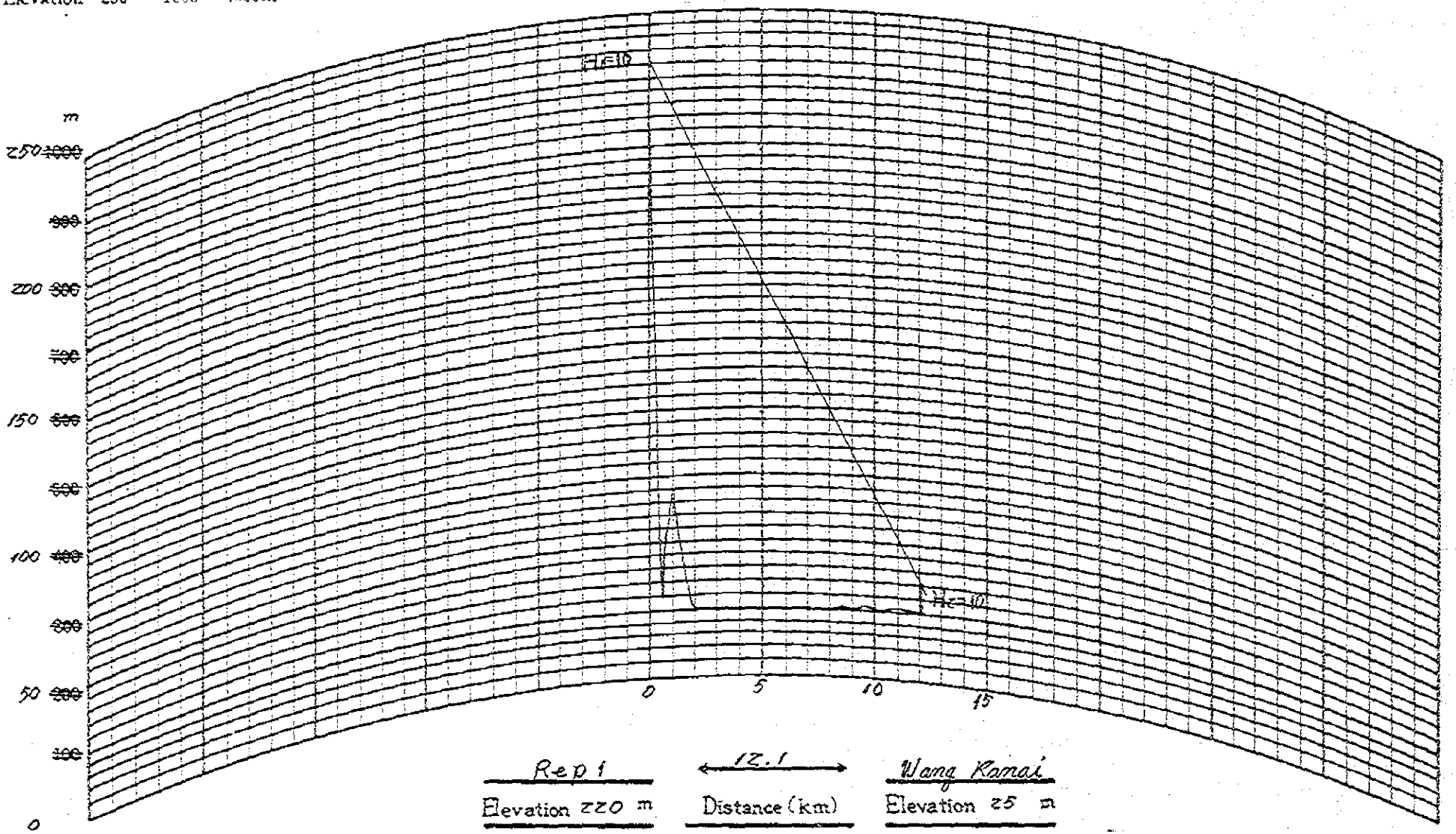
Distance 60 ~~120~~ ~~240~~km

Elevation 250 ~~1000~~ ~~4000~~m

PROFILE MAP (4/3 Radius)

NO. 9

DATE



Rep 1 ← 12.1 → Wang Kanai

Elevation 220 m | Distance (km) | Elevation 25 m

Note : The altitude scale shall be multiplied by 1/4 or 4. as the distance is plotted in half or double scale.

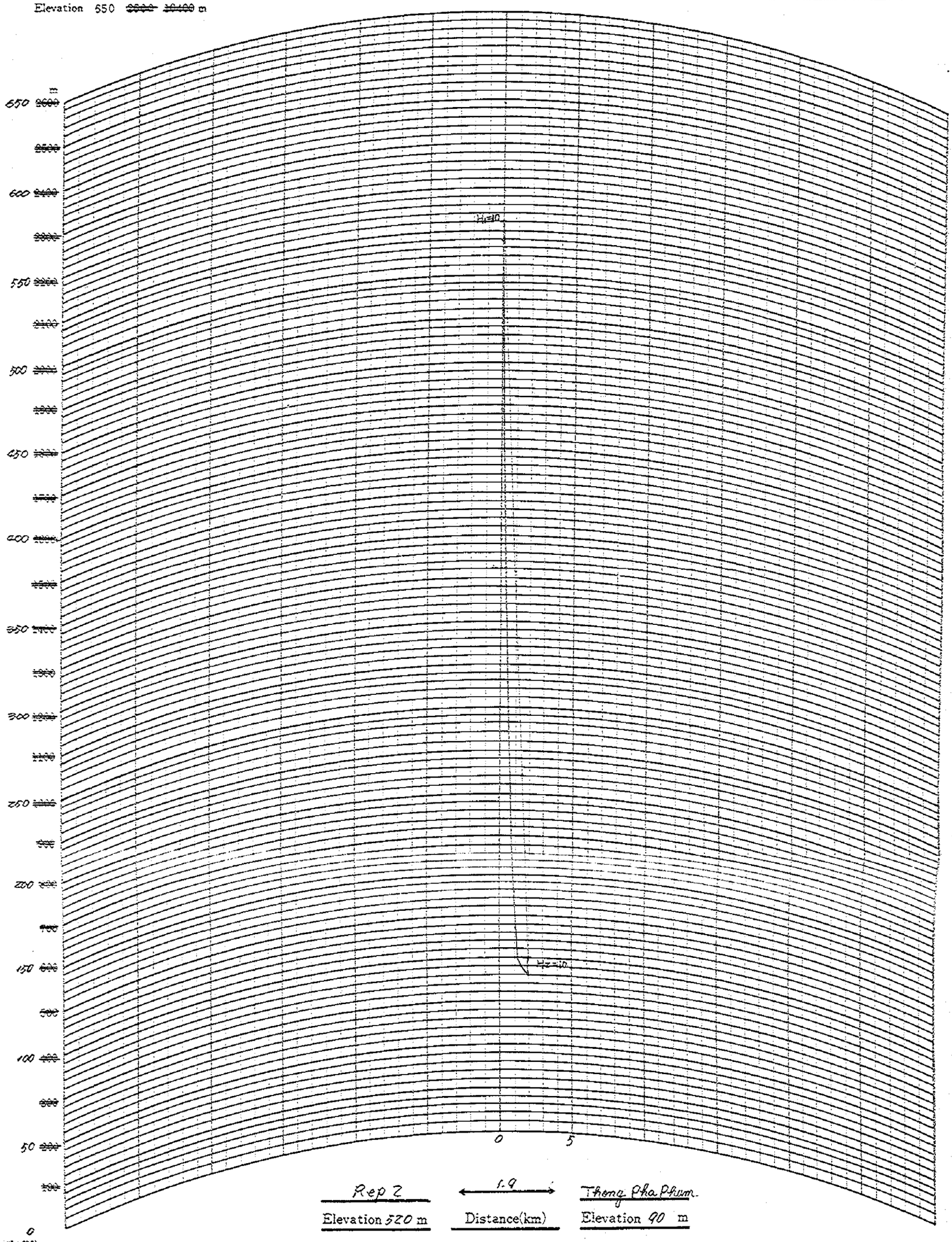
Distance 60 ~~120~~ ~~240~~km

Elevation 650 ~~2600~~ ~~10400~~ m

PROFILE MAP (4/3 Radius)

NO. 10

DATE



Rep 2 — Elevation 520 m

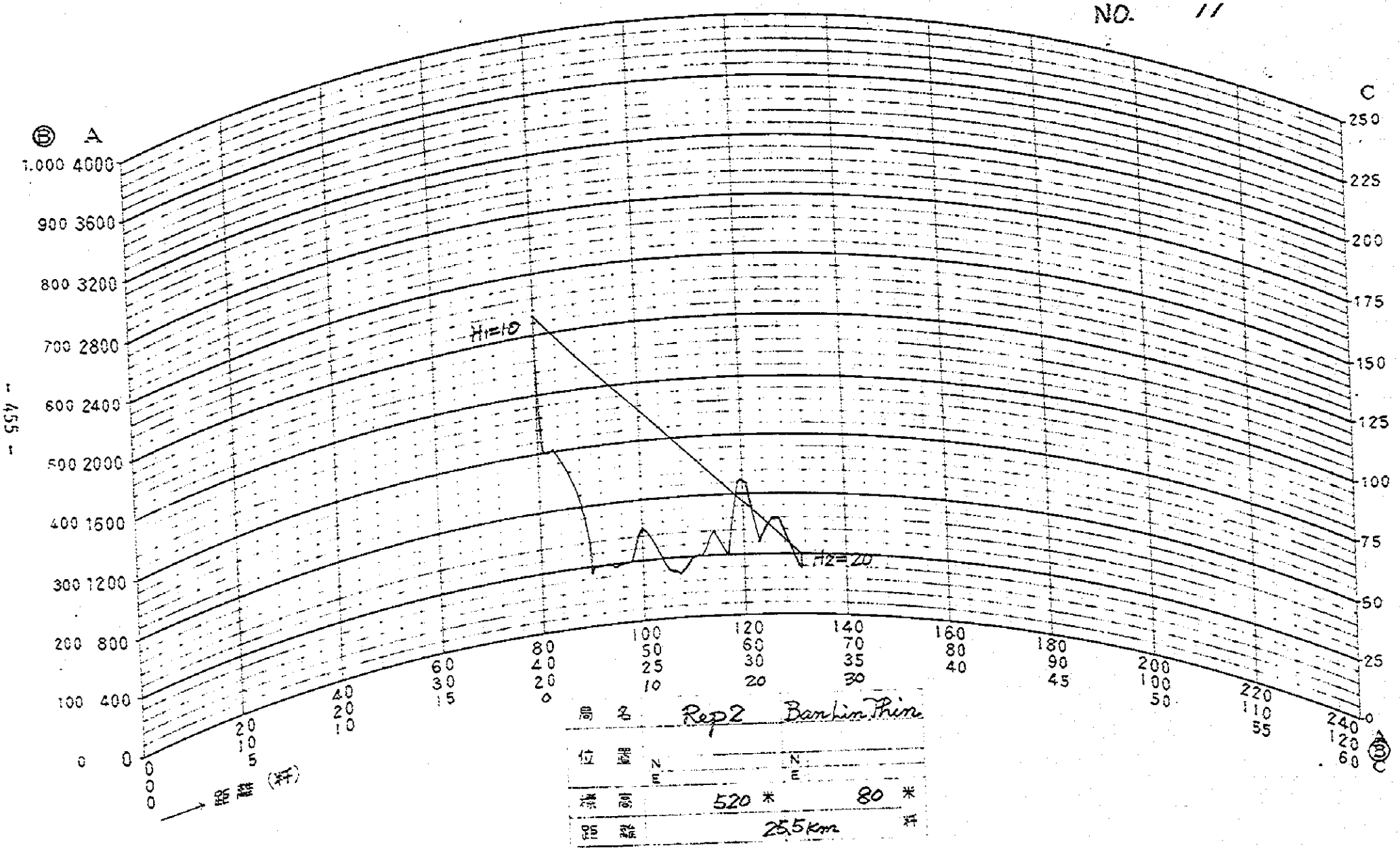
1.9 — Distance(km)

Thong Pha Phum — Elevation 90 m

(RA315)

見 返 図

NO. 11



JIS A4