

**Recommendation T/R 20-01 (Interlaken 1968)
(amended at Montreux 1970, Stockholm 1976 and Ostend 1979)**

OPERATION OF THE EUROPEAN RADIO-PAGING SERVICE

Recommendation proposed by the "Radiocommunications" Working Group T1/WG 3

*Text of the revised Recommendation adopted by the "Telecommunications"
Commission:*

"The European Conference of Postal and Telecommunications Administrations,

considering

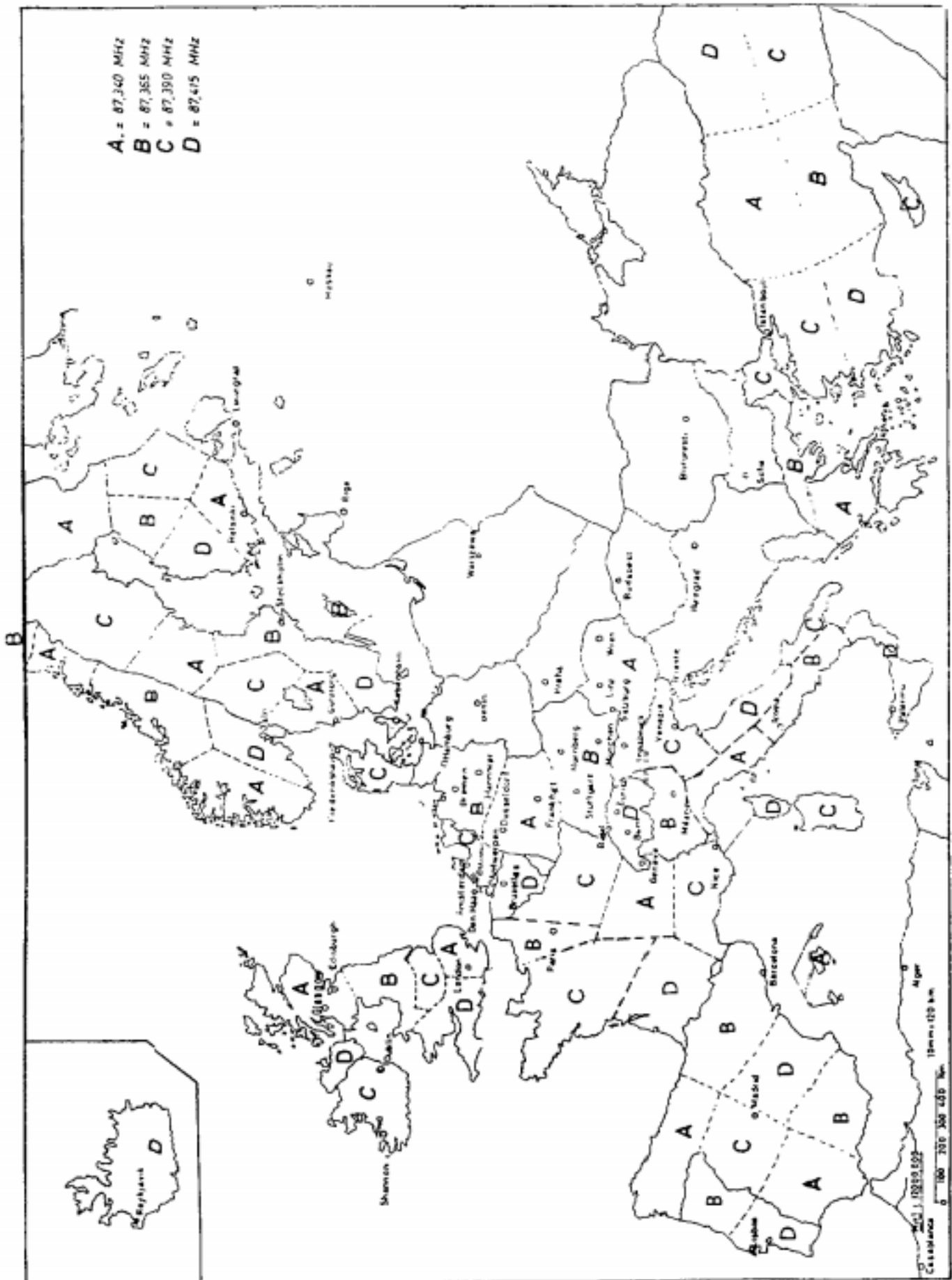
- that the introduction of a European radio-paging system is imminent in several CEPT countries,
- that this introduction raises a number of operational problems.
- that experience is already available from Administrations operating a paging service,
- that propagation tests have been carried out by various Administrations in order to determine the risk of interference,

recommends

1. that Administrations wishing to establish a radio network within the European paging system should take into account the number and geographical limits of the base networks indicated in Annex 1 to this Recommendation, bearing in mind, when selecting the location and the power of transmitting stations, the interference which may be caused in other base networks, and should, where appropriate, carry out the necessary co-ordination,
2. that Administrations should resolve, by the normal procedure, cases of interference between base networks, between the paging service and other services, and interference in the paging service due to emissions from industrial, scientific, medical and other installations. For the evaluation and reduction of interference, see Annex 2,
3. that code numbers should be allocated in accordance with Annex 3 to this Recommendation, in which:
 - 3.1. the code numbers of subscribers wishing to be called in their country of residence and in the CEPT member countries participating in the service are arranged in one particular group,
 - 3.2. the code numbers of subscribers wishing to be called in their country of residence only are allocated in such a way that the same first figure is given to all the code numbers for a given country,
4. that receivers in the European radio-paging service should comply with the provisions of Annex 4 to this Recommendation,
5. that a central Office should be responsible:
 - initially, for allocating blocks of code numbers to various countries,
 - subsequently, for centralising and disseminating all information concerning planned networks and the operation of the European paging service.
 - and consequently, that the task of managing the central Office should be given, at least to begin with, to a specific Administration.
6. that the call exchanges in the European radio-paging service should conform to the provisions of Annex 5 to this Recommendation."

Annex 1

PLAN OF BASE NETWORKS AND ALLOCATION OF RADIO FREQUENCIES



Annex 2

INTERFERENCE CAUSED BY TRANSMITTERS IN THE RADIO-PAGING SERVICE

1. EVALUATION OF INTERFERENCE

For a first evaluation of interference, the curves given in CCIR Recommendation 370-1 (or curves commonly agreed between the Administrations concerned) should be used, together with the values indicated in CCIR Report 358.

In the case of mutual interference between base networks in the radio-paging service, the protection ratios indicated in point 2.7 of the final report of the R6 subgroup (Report of the "Telecommunications" Commission, Rome 1967, pages 107 and 108) shall be observed.

In critical cases, on-site measurements are recommended.

2. MEASURES FOR REDUCING INTERFERENCE

Interference caused to other base networks or other services can be reduced:

- by covering a given area with several low-power transmitters rather than with one higher-power transmitter;
- by placing a low-power transmitter in a high position rather than using a more powerful transmitter with an antenna of lesser equivalent height;
- by limiting, through the use of directional antennas, the effective power radiated towards regions in which interference could occur.

Mutual interference between the VHF broadcasting service and the paging service can be reduced by placing the transmitters so that the ratio between the field intensities remains substantially the same throughout the area covered.

Some of the measures suggested above are contradictory. The choice will take into account, in each case, the specific technical conditions and economic factors.

Annex 3

Allocation of code number BLOCKS

Country	Blocks of numbers provisionally reserved		1st block of numbers definitely allocated	
	for national subscribers	for international subscribers	for national subscribers	for international subscribers
1	2	3	4	5
Germany	100,000...199,999	810,000...819,999	100,000...109,999	810,000...810,999
Great Britain	200,000...299,999	820,000...829,999	200,000...209,999	820,000...820,999
Italy/Vatican San Marino	300,000...399,999	830,000...839,999	300,000...309,999	830,000...830,999
France/Monaco	400,000...499,999	840,000...849,999	400,000...409,999	840,000...840,999
Spain	500,000...559,999	850,000...855,999	500,000...505,999	850,000...850,999
Portugal	560,000...579,999	856,000...857,999	560,000...561,999	856,000...856,999
Greece	580,000...599,999	858,000...859,999	580,000...581,999	858,000...858,999
Sweden	600,000...619,999	860,000...861,999	600,000...601,999	860,000...860,999
Finland	620,000...629,999	862,000...862,999	620,000...620,999	862,000...862,999
Denmark	630,000...639,999	863,000...863,999	630,000...630,999	863,000...863,999
Norway	640,000...649,999	864,000...864,999	640,000...640,999	864,000...864,999
Iceland	650,000...654,999	865,000...865,999	650,000...650,999	865,000...865,459
Cyprus	655,000...659,999	865,000...865,999	655,000...655,999	865,500...865,999
Belgium	660,000...679,999	866,000...867,999	660,000...661,999	866,000...866,999
Netherlands	680,000...699,999	868,000...869,999	680,000...681,999	868,000...868,999
Luxembourg	700,000...709,999	870,000...870,999	700,000...700,999	870,000...870,999
Switzerland/ Liechtenstein	710,000...729,999	871,000...872,999	710,000...711,999	871,000...871,999
Austria	730,000...749,999	873,000...874,999	730,000...731,999	873,000...873,999
Turkey	750,000...789,999	875,000...878,999	750,000...753,999	875,000...875,999
Ireland	790,000...799,999	879,000...879,999	790,000...790,999	879,000...879,999
000,000...099,999	National Extension			
900,000...999,999 880,000...899,999 800,000...809,999	International Extension			

Annex 4

**TECHNICAL SPECIFICATIONS FOR THE "EUROSIGNAL" RECEIVER
IN THE EUROPEAN RADIO-PAGING SERVICE**

1. PURPOSE AND SCOPE OF THE SERVICE

The purpose of the European radio-paging service is to enable coded signals to be transmitted from public network telephones to mobile subscribers. To this end, the entire territory of the CEPT Administrations will be divided into 50 to 100 base radio networks. VHF transmitters covering a base network are linked to a call exchange where, among other things, the code signals are formed which modulate the call transmitters. If allowed by automatic trunk exchanges, telephone subscribers can directly transmit their calls by dialling the code number preceded by the call exchange code. A caller will be informed automatically that his call has been accepted, by an announcement including the word "Eurosinal" followed by the name of the base network.

The transmitted code signals are received by call receivers which analyse them. If the code received matches the code allocated to the decoder, an audible and a visual signal will be triggered. The meaning of the coded signals has to be agreed between the radio-paging service subscriber and Ins callers. No possibility of direct reply by radio is provided. Consequently, the public telephone network will be used for any subsequent exchange of information.

Since some subscribers may wish to receive several differentiated calls, their receivers will need to be allocated a corresponding number of codes. In order to make the decoders simple, the codes allocated to a given receiver should differ from each other only by the last digit, so that a maximum of 10 codes can be allocated to one receiver. However, Administrations may restrict this number.

2. TECHNICAL FACILITIES

Three transmitting frequencies forming one channel shall be used in each base network. To prevent interference, the transmitters shall be sited so that a receiver tuned to the centre frequency F_0 of the channel can receive, at roughly equal field intensities, the emissions from no more than 3 transmitters operating respectively on the 3 frequencies $F_0 + 4$ kHz, F_0 and $F_0 - 4$ kHz.

The centre frequencies of the 4 channels to be used in the European radio-paging service are shown in Annex 4.1 (page 12). They are positioned between 87.340 MHz and 87.415 MHz at a separation of 25 kHz. Unless otherwise stated, the median field intensity at the limits of the base network shall be at least 26 dB above $1 \mu\text{V/m}$, or 14 dB above $1 \mu\text{V/m}$ in mountainous regions.

The transmitters shall use amplitude modulation. They shall be modulated at the interval frequency ($f_i - 1153.1$ Hz) between calls. The interval frequency and code signals are produced by the single call exchange for each base network.

The code numbers used in the European radio-paging service consist of 6 digits (with a planned increase to 7 digits at a later stage. This increase will not affect decoders in service at the time when it occurs). After receiving the complete series of pulses transmitted by the caller, the call exchange translates the series into a code signal. The signal consists of 6 elements. Each element is formed by transmission of a single frequency as specified in Annex 4.2 (page 13). Each signal is transmitted simultaneously by modulation circuits to all the transmitters in the base network.

So long as the number of subscribers does not go beyond one million, each digit from 0 to 9 will be represented by one of the frequencies f_0 , to f_9 , (see Annex 4.2 [page 13]). If two consecutive digits in the number are identical, the second digit will be represented by a "repetition frequency" ($f_r = 1062.9$ Hz) to differentiate the consecutive elements of the signal.

For example, the code number:

33 55 56

is transmitted to the transmitter as the frequency series:

$f_3 f_r f_5 f_r f_5 f_6$

Each signal element has a duration of 100 ms. The 6-element code is followed by a pause of at least 200 ms to enable the decoders to return to the off-position before the next call.

The "Eurosignal" receivers have a frequency switch and an indicating device to show whether the receiver sensitivity and field intensity are sufficient to guarantee call reception. The reception of a call is indicated by a short audible signal and activates a visual signal which continues to show until the user intervenes.

3. RECEIVER SPECIFICATIONS

"Eurosignal" receivers can be used in vehicles, as portable appliances and, if necessary, as fixed units. They shall comply with the following specifications:

3.1. Mechanical characteristics

All monitoring, signalling and control devices shall be easily visible and readily accessible in operation.

The receivers shall carry a rating plate which must remain clearly visible even if they are installed as fixed units. The rating plate shall contain the following information:

- Manufacturer's name
- Receiver type
- Type-approval information, if any.

The serial number and power supply particulars shall also be visible from the outside.

The receivers shall be capable of operating under the special conditions obtaining in a travelling vehicle and of withstanding prolonged buffeting and vibration. They shall be capable of operating during and after a 5-minute vibration test with a vibration amplitude of 1 mm and a frequency of 30 Hz at maximum (acceleration up to 3 g).

It would be desirable if, in the design of the appliance, manufacturers took account of the most up-to-date facts known about vehicle passenger safety.

Receivers intended for use as portable appliances shall be capable of operating after being dropped three times from a height of 80 cm on to a wooden floor.

The code number or numbers shall be indicated on the receiver in such a way that only authorised persons can obtain them.

3.2. Temperature

Unless stated otherwise, the receivers shall meet these specifications at ambient temperatures between

- 20 C and +50 C. The receivers shall not suffer any lasting damage at ambient temperatures between
- 30 C and +70 C, whether or not they are being used.

3.3. **Power supply**

The supply voltages are defined as follows:

Nominal voltages: the voltages generally used, e.g. 6 volts, 12 volts, 24 volts, 110 volts and 220 volts.

Working voltages: the voltages actually applied to the receiver in operation.

When testing the appliances in the laboratory, the following normal working voltages shall be applied:

- for lead acid batteries, 2.1 volts per cell;
- for other types of batteries, the voltage of a new battery of the type indicated by the manufacturer.

Unless stated otherwise, the receivers shall meet these specifications at working voltage variations of $\pm 15\%$ relative to the nominal value.

For integral batteries, the types and voltages in general use in Europe are recommended. Consumption should be as low as possible. It should be easy to replace or charge the power source.

3.4. **Radio frequencies**

The receivers will be operating on channels 3 to 6 in Annex 4.1 (page 12).

Receivers with an international code number shall be capable of operating on the 4 channels.

Receivers with a national code number may only be equipped to operate on the frequencies of the base networks in which they are intended to receive calls, but they shall be easily adaptable to any one of the channels.

Receivers equipped for two or more channels shall have a frequency switch.

3.5. **Code numbers**

The receiver shall be fitted with a decoder permitting operation on one or more code numbers. The decoder shall be adaptable to any of the code numbers that may be allocated.

Administrations shall take measures to prevent misuse of the receiver. This may be done by supplying the part fixing the code number or numbers as a removable component forming all or part of the decoder in accordance with the specifications of the Administrations concerned. The manufacturer will only supply this component if authorised by the Administration.

Access to the decoder and the removable component shall be barred to subscribers.

3.6. **Sensitivity**

3.6.1. The sensitivity is defined as the minimum input e.m.f.¹⁾ of a signal modulated at a factor of 90%²⁾ by the code signal which activates the call indicator. The sensitivity shall be measured by a series of five consecutive calls, increasing the e.m.f. applied to the input. The sensitivity shall be obtained when the call indicator has been triggered five times out of five in at least two of the five-call series during three consecutive series. The test shall be performed on the 3 frequencies specified below, at an ambient temperature of 20° C and the normal working voltage.

Notes.

¹⁾ Always measuring the r.m.s. value of the carrier.

²⁾ Always relative to the weakest signal element.

The carrier frequency may be at F_0 , $F_0 - 5$ kHz, $F_0 + 5$ kHz. It shall be modulated by a code signal consisting of 6 signal elements at the frequencies specified in Annex 4.2 (page 13). The test shall be performed with various code combinations so as to bring in all the audio frequencies that may form the code signal. The sensitivity measured at the receiver antenna terminal in the vehicle shall be ≤ -3 dB μ V (e.m.f.). When being used as a portable appliance, the sensitivity shall correspond to a field strength of ≤ 2 μ V/m in the least favourable orientation, with the receiver in the normal reception position.

- 3.6.2. Under the least favourable temperature (3.2.) and supply voltage (3.3) conditions and with a modulation factor of 80%, the call indicator shall be triggered each time in five consecutive tests at an e.m.f. $\leq +3$ dB μ V. When being used as a portable appliance, this limit shall correspond to a field strength of 4 μ V/m.

3.7. **Call signalling**

The visual indicator triggered by a call shall be accompanied by an audible signal lasting from about 3 to 5 seconds, which cuts out automatically. The visual indicator shall only be capable of being switched off by hand.

3.8. **Checking and indication of inadequate reception**

It shall be possible to check at any time whether reception is sufficient to enable a call to come through. Care should be taken to ensure that if interference occurs, this check does not give a false indication. To this end, it could be based, for example, on the presence of the interval frequency.

In addition, when the input e.m.f. remains below a threshold at least 3 dB above the receiver's sensitivity, the shortest duration of such a signal which shall produce an intermittent audible and possibly visual alarm signal, shall be between 14 and 21 seconds. However, if the input e.m.f. remains above 3 dB μ V, no alarm signal shall be triggered. When being used as a portable appliance, this limit shall correspond to a field strength of 4 μ V/m.

3.9. **Two-frequency selectivity**

A wanted carrier on the centre frequency of the channel, modulated at 90% by the call signal and with an e.m.f. of 9 dB μ V shall be applied to the receiver input.

An unmodulated interfering carrier shall be applied simultaneously at a frequency more than 20 kHz away from the wanted carrier. It shall not cause any call to be suppressed so long as its e.m.f. does not go more than 80 dB above the e.m.f. of the wanted signal. This requirement shall be met particularly for the intermediate frequencies and image frequencies of the receiver.

3.10. **Intermodulation**

A wanted carrier on the centre frequency of the channel, modulated at 90% by the code signal and with an e.m.f. of 9 dB μ V, shall be applied to the receiver input.

Two unmodulated interfering carriers of the same amplitude shall be applied simultaneously. Their frequencies shall be such that at least one of their intermodulation products falls within the wanted channel.

If one of the interfering carriers is 25 kHz away and the other 50 kHz away, on the same side of the wanted carrier, they shall not cause any call to be suppressed at an e.m.f. no more than 60 dB above the wanted signal.

If the interfering carriers are more than 1 MHz away from the wanted frequency, they shall not cause any call to be suppressed at an e.m.f. no more than 70 dB above the wanted signal.

If either of the interfering carriers is equal to or lower than 30 MHz, they shall not cause any call to be suppressed at an e.m.f. no more than 80 dB above the wanted signal.

3.11. Protection against unwanted calls

The call indicator shall not be triggered:

- 3.11.1. - when a wanted carrier modulated at 90% by the interval frequency and with an e.m.f. between -6 and +86 dB μ V is applied to the receiver input at the same time as an interfering signal more than 100 kHz away from the wanted carrier and modulated at 90% by the call signal, if the e.m.f. of the interfering signal is \leq 86 dB μ V;
- 3.11.2. - when a wanted carrier modulated at 90% by a signal whose only difference compared with the receiver code signal is an interval of \geq 200 ms between two signal elements, is applied to the receiver input with an e.m.f. between 3 and 100 dB μ V: during the interval, the wanted carrier may either be modulated at 90% by the interval frequency, or suppressed;
- 3.11.3. - when a wanted carrier modulated at 90% by a signal whose only difference compared with the receiver signal code is a shift in one of the frequencies making up the signal by \pm 6% away from its nominal value, is applied to the receiver input with an e.m.f. between 3 and 100 dB μ V;
- 3.11.4. - when the following are applied simultaneously to the receiver input:
 - a wanted carrier modulated at 90% with an e.m.f. between 3 and 100 dB μ V, by a signal whose only difference compared with the receiver code signal is the frequency of one of the signal elements, being replaced by any of the calling frequencies, especially an adjacent frequency;
 - an interfering signal consisting of a succession of very short pulses (pulse duration \leq 1 ns) with a repetition frequency between 30 and 300 Hz and a high-frequency interference level. measured over 50 ohms, 70 dB above 1 μ V/MHz.

The suppression of one of the above two signals shall not activate the call indicator.

3.12. Protection against call loss

The following specifications shall be met at an ambient temperature of 20° C and a normal working voltage.

The call indicator shall be activated every time, in five consecutive tests:

- 3.12.1. - when a wanted carrier with an e.m.f. between -3 and + 100 dB μ V and modulated at 90% by the receiver signal code is applied to the receiver input;

3.12.2. when two wanted signals of the same amplitude. with an e.m.f. between 3 and 60 dB μ V, modulated at 90% by the receiver signal code are applied to the receiver input, with a 340 μ s difference in propagation time between the two call signals; for the highest audio frequency, this difference corresponds to a phase shift of 130°; for this test, the highest audio frequencies shall be used.

The frequencies of the two wanted signals shall be associated as follows:

- F₀ and F₀ +4 kHz
- F₀ and F₀ -4 kHz
- F₀- 4 kHz and F₀+ 4 kHz

3.12.3. when two wanted signals with an amplitude difference of 6 dB, modulated at 90% by the receiver code signal are applied to the receiver input, with any degree of difference in propagation time between the two call signals. A propagation time difference of 470 μ s corresponds to a phase shift of 180° for the highest audio frequency; for this test, the highest audio frequencies shall be used, together with the radio frequencies and e.m.f. levels in the following Table:

Wanted signal 1		Wanted signal 2	
e.m.f.	Frequency	Frequency	e.m.f.
9 dB 66 dB/ μ V	F ₀	F ₀ + 4 kHz	9 dB 66 dB/ μ V
	F ₀ + 4 kHz	F ₀	
	F ₀	F ₀ - 4 kHz	
	F ₀ - 4 kHz	F ₀	
	F ₀ + 4 kHz	F ₀ - 4 kHz	
	F ₀ - 4 kHz	F ₀ + 4 kHz	

For this test. the radio frequencies shall be associated line by line according to the Table above.

- 3.12.4. - when a wanted signal with an e.m.f. between 3 and 60 dB μ V, modulated at 90% the receiver code signal is applied to the receiver input, modified as follows:
The duration of the call signal elements shall be reduced to 40 ms and the elements shall be separated by a pause of 60 ms.
- 3.12.5. - when the following are applied simultaneously to the receiver input:
 - a wanted carrier modulated at 90% by the receiver code signal with an e.m.f. between 3 and 60 dB μ V;
 - an interfering signal consisting of a succession of very short pulses (pulse duration \leq 1 ns) with a repetition frequency between 30 and 300 Hz and a high-frequency interference level, measured over 50 ohms, 70 dB above 1 μ V/MHz.

3.13. **Power radiated by the receiver**

The power radiated by the receiver shall not exceed 2 · 10⁻⁹ watt, on any frequency.

3.14. **Control and indicating devices**

All control and indicating devices shall be integral with the receiver. It is recommended that they be grouped together on the same panel.

The receiver shall have:

- 3.14.1. - an on/off switch;
- 3.14.2. - for appliances with two or more radio channels, a channel switch designating the channels to be selected;
- 3.14.3. - call indicator(s);
- 3.14.4. - a manual device for switching off the visual call indicator(s);
- 3.14.5. - reception conditions indicator(s);
- 3.14.6. the ability to check:
 - that the power supply is sufficient;
 - that all visual and audible indicators whose failure is not automatically signalled are in working order.A single control device is recommended for this purpose.

Annex 4.1
FREQUENCIES OF HF CHANNELS

Channel ¹⁾	Frequency MHz ²⁾
3	87.340
4	87.365
5	87.390
6	87.415

Frequency spacing of adjacent transmitters in the same base network, relative to the centre channel frequency:

- 0 kHz
- +4 kHz
- 4 kHz

Notes.

¹⁾ Channels 1 (87.290 MHz), 2 (87.315 MHz), 7 (87.440 MHz) and 8 (87.465 MHz) are intended for local networks covering less extensive paging areas. The coding methods used in this case could be modified.

Given the operational necessity, some countries might envisage using these channels to cover particular areas with a high customer density, provided measures are taken to prevent substantial radiation outside those areas.

²⁾ Tolerance of $\pm 6 \cdot 10^{-6}$.

Annex 4.2

COMPOSITION OF CODE SIGNALS

COMPOSITION OF WANTED SIGNALS

Unless stated otherwise in these specifications, the wanted signals used for measurements shall possess the following properties:

- (a) Variations in level during a call shall be no greater than 1 dB.
- (b) The envelope of the high-frequency input signal shall be formed in such a way that the last peak value of one signal element is separated by 0 to 5 ms from the first peak value of the next signal element. The peak values used for measurement purposes shall be at least 90% of the full amplitude value.
- (c) The duration of a signal element measured from the first to the last peak value shall be $100 \text{ ms} \pm 5 \text{ ms}$. The peak values used for measurement purposes shall be at least 90% of the full amplitude value.

IMPEDANCE OF MEASURING INSTRUMENTS

The measuring instruments for connecting to the receiver input shall have an asymmetric internal resistance of 50Ω . If the input resistance of the receivers is different from this value, adaptor networks and the characteristic values shall be supplied

Meaning of signals	Abbreviation	Frequency in Hz ¹⁾
Interval	f_i	1.153.1
Repetition	f_r	1.062.9
Figure 0	f_0	979.8
Figure 1	f_1	903.1
Figure 2	f_2	832.5
Figure 3	f_3	767.4
Figure 4	f_4	707.4
Figure 5	f_5	652.0
Figure 6	f_6	601.0
Figure 7	f_7	554.0
Figure 8	f_8	510.7
Figure 9	f_9	470.8

Table 1 (T/R 20-01). Frequency table for signal coding

Note

¹⁾ Emission tolerance $\pm 0.1\%$

Increase in the number of code numbers to beyond one million

All 6-digit code numbers can be formed by 6 signal elements transmitted consecutively using the frequencies in Table I (T/R 20-01). To increase the number of code numbers to 7 million, the 5 frequencies shown in Table II (T/R 20-01) will be used without increasing the number of signal elements.

Abbreviation	Frequency in Hz ¹⁾
f ₁₀	433.9
f ₁₁	400.0
f ₁₂	368.7
f ₁₃	339.9
f ₁₄	313.3

Table II (T/R 20-01). Additional frequencies.

An extra digit placed at the front to bring the number of code number digits to 7 will indicate that the additional frequencies are being used for some elements instead of the frequencies in Table 1 (T/R 20-01).

Table III (T/R 20-01) below shows the coding method.

The figure 1 at the start of the number will tell the coder that the series of signal elements is to be transmitted unchanged, as prior to the increase in the number of code numbers.

The 9 figures 2 to 0 at the start of the number will tell the coder the signal elements for which to change the f₀-f₄ and/or f₅-f₉ frequencies to f₁₀-f₁₄.

Note.
¹⁾ Emission tolerance ±0.1%.

The first figure Of the 7-digit call - number is a	Change of frequencies at positions 2-7 in the 7-digit call number: x = frequencies f_0-f_4 are changed to $f_{10}-f_{14}$ + = frequencies f_5-f_9 are changed to $f_{10}-f_{14}$						Number of codes
	2	3	4	5	6	7	
1							1.000.000
2	x						500.000
2	+	x					250.000
3		x					500.000
3		+	x				250.000
4			x				500.000
4			+	x			250.000
5				x			500.000
5				+	x		250.000
6					x		500.000
6					+	x	250.000
7						x	500.000
7		x				+	250.000
8	x		x				250.000
8	+			x			250.000
9		x		x			250.000
9		+			x		250.000
0			x		x		250.000
0			+			x	250.000
Total 1... 0							7.000.000

Table III (T/R 20-01). Coding diagram to be used for increasing capacity from 1 to 7 million codes.

Coding examples

Call number	Frequency series					
1.345.479	3	4	5	4	7	9
1.333.333	3	r	3	r	3	r
3.333.333	3	13	3	r	3	r
3.383.333	3	13	r	3	r	3
6.333.333	3	r	3	r	13	3
6.333.383	3	r	3	r	13	r
9.333.333	3	13	3	13	3	r
9.383.333	3	13	3	r	13	3

Annex 5

**TECHNICAL CHARACTERISTICS OF A CALL EXCHANGE
IN THE EUROPEAN RADIO-PAGING SYSTEM**

The general specifications for the system recommended for the European radio-paging service are set out in Recommendation T/R 21-02 E (Rome 1967). The attention of Administrations is drawn to the final report of the R6 subgroup (Report on the work of the "Telecommunications" Commission (Rome 1967), point 2.1., page 102) which provides information on the measures to be taken when a base network contains several transmitters. The procedure to be used for forming 7 million code numbers is shown in Annex 4.2 to this Recommendation.

1 FREQUENCY GENERATOR AND CODER

- 1.1. The tolerance for audio frequencies is $\pm 0.1\%$ with an ambient temperature variation of $\pm 5^\circ\text{C}$.
- 1.2. The level of signals provided by the call exchange shall not vary by more than $\pm 0.5\text{ dB}$, which will make it possible in practice to maintain a modulation factor of 85% to 100%.
- 1.3. The difference between the level of the wanted audio frequency and the total residue of the other audio frequencies shall be at least 40 dB.
- 1.4. The interval between two consecutive calls shall be $220 \pm 10\text{ ms}$ at peak times.
- 1.5. Where an Administration considers it useful for the call to be repeated to increase security of reception, the interval between the first call and the repeat call shall not exceed one minute.

2 CALL EXCHANGE REGISTERING

Taking into account CCITT Recommendation Q.84 (white book vol. VI, page 125 etc., Mar del Plata 1968), the number of call exchange registers shall be determined so that the probability of loss is not substantially greater than with an ordinary telephone link. Consequently, the call exchange loss probability taken in isolation during the busiest hour shall be lower than 1%. Efforts should be made to achieve a probability factor of 0.1%.

3. CALL EXCHANGE SIGNALS AND TONES

- 3.1. After receiving and registering the entire call number of the pager, the call exchange transmits the response signal which starts the charging tally.
After a protective delay of at least 4 seconds, the call exchange transmits the "Eurosignal ..." announcement. After transmitting two "Eurosignal ..." announcements, the call exchange transmits the hangup, signal. The call will be transmitted by radio as soon as possible after the end of the protective delay mentioned above.
If the disconnect signal is received before starting to send the "Eurosignal ..." announcement, the call will not be transmitted to the pager and the equipment will be cleared immediately.
If the disconnect signal is received after starting to send the "Eurosignal ..." announcement, the equipment will be cleared on the telephone network but the process of calling the pager by radio will not be stopped.
- 3.2. If all the units of the call exchange are completely engaged, the exchange will transmit to the telephone network the engaged signal or tone or an appropriate tone of the national network.
- 3.3. If a breakdown affecting the transmission of calls occurs in the transmitter network or the call exchange, the subscriber will be alerted by the special information tone combined with an appropriate message, e.g. "Eurosignal ... Breakdown".

If there is no special information tone, Administrations may provisionally transmit the engaged tone. An appropriate tone of the national network may also be used.
- 3.4. When a register receives a number that does not belong to the international or national numbering system the pager will not be called. The caller receives the special information tone combined with the announcement "The number called is not in service".
If there is no special tone, Administrations may provisionally use the engaged tone.
An appropriate tone of the national network may also be used