



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

M.540

**MAINTENANCE:
INTERNATIONAL TRANSMISSION SYSTEMS
(ANALOGUE)**

**ROUTINE MAINTENANCE OF CARRIER
AND PILOT GENERATING EQUIPMENT**

ITU-T Recommendation M.540

(Extract from the *Blue Book*)

NOTES

- 1 ITU-T Recommendation M.540 was published in Fascicle IV.1 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).
- 2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation M.540

ROUTINE MAINTENANCE OF CARRIER AND PILOT GENERATING EQUIPMENT

1 If a country has a national frequency standard, it is desirable to use it for checking the frequency of the master oscillators of carrier systems. (See Table 1/M.540 showing the recommended frequency accuracy for various carrier systems.) This frequency standard can be guaranteed to about 1 part in 10^8 by means of the three-way frequency comparisons organized by the CCIR. However, we must note that a larger accuracy can be obtained in the countries that will use an atomic frequency standard (for example cesium or rubidium).

2 If a country has no national frequency standard, there are two possibilities:

- a) to receive by radio the standard signals transmitted in accordance with CCIR Recommendations;
- b) to receive from a neighbouring country, over a metallic circuit, a frequency derived from the national standard of that country.

It may be necessary in some cases to make a direct comparison of the frequency of the master oscillators of the carrier systems of different countries; this comparison will be effected by means of the frequency comparison pilots.

3 The changeover of master oscillators may cause a short interruption of a few milliseconds and a sudden phase-change. Because the effect of these interruptions and phase-changes is felt throughout the carrier system, changeover of master oscillators should be made only when absolutely necessary.

TABLE 1/M.540

Table showing the recommended frequency accuracy for reference pilots, carriers, etc., in various carrier systems

System	Frequency and accuracy		
	Reference pilot		Carrier generator
(1)	(2)		(3)
(1 + 3) open-wire	16.110 kHz 31.110 kHz	2.5×10^{-5}	2.5×10^{-5}
8 circuit open-wire			10^{-5}
12 circuit open-wire	5×10^{-6}		5×10^{-6}
Symmetric pair 1, 2, 3, 4 or 5 groups	Line regulating 60 kHz	± 1 Hz	Channel virtual carriers of a group $\pm 10^{-6}$ Groups and supergroups $\pm 10^{-7}$ Mastergroups and supergroups $\pm 5 \times 10^{-8}$
	Auxiliary	± 3 Hz	
2 supergroups	Line regulating 60 kHz 556 kHz	± 1 Hz ± 3 Hz	
	2,6 MHz Line regulating 2 604 kHz	± 30 Hz	
Coaxial pair 2.6/9.5 mm	4 MHz Line regulating 60 kHz 308 kHz 4 092 kHz Auxiliary 2 792 kHz	± 1 Hz ± 3 Hz ± 40 Hz	
		Additional measuring frequencies (all) ± 40 Hz	
	12 MHz Line regulating 308 kHz 4 287 kHz 12 435 kHz	$\pm 1 \times 10^{-5}$	
		Additional measuring frequencies: < 4 MHz > 4 MHz ± 40 Hz $\pm 1 \times 10^{-5}$	
	60 MHz Line regulating 4 287 kHz 12 435 kHz 22 372 kHz 40 920 kHz 61 160 kHz	$\pm 1 \times 10^{-5}$	
		Additional measuring frequencies (all) $\pm 1 \times 10^{-5}$	
Coaxial pair 1.2/4.4 mm	1.3 MHz Line regulating 1 364 kHz Auxiliary 60 or 308 kHz	$\pm 1 \times 10^{-5}$ $\pm 1 \times 10^{-5}$	
		4 MHz Line regulating 60, 308, 4 287 kHz $\pm 1 \times 10^{-5}$	
	6 MHz Line regulating 308, 4 287 kHz $\pm 1 \times 10^{-5}$		

TABLE 1/M.540 (end)

System	Frequency and accuracy		
	Reference pilot	Carrier generator	
(1)	(2)	(3)	
12 + 12	60 kHz Others by agreement between Administrations	± 1 Hz	Error in reconstituted frequency over a 140 km section and not to exceed 0.3 Hz (provisional value)
6 MHz			Video carrier 1056 kHz ± 5 Hz
12 MHz			Video carrier 6799 kHz ± 100 Hz
4 kHz spacing Basic group B and Basic supergroup	84.080 kHz 104.080 kHz 411.920 kHz and 547.920 kHz 84.140 kHz and 411.860 kHz	± 1 Hz ± 3 Hz	
Basic mastergroup and 15-supergroup assembly	1 552 kHz	± 2 Hz	
Basic supermastergroup	11 096 kHz	± 10 Hz	
3 kHz spacing	84 kHz (or other frequency by agreement)	± 1 Hz	
Basic group and Basic supergroup	a)		

a) A supergroup reference pilot frequency of 444 kHz with a tolerance of ± 1 Hz is used.