Chapter 3

The R&TTE Directive

The R&TTED is given a separate chapter in this book because of the proliferation of all types of product which incorporate wireless or telecom connectivity. As soon as any product includes a wired or wireless modem or a short-range receiver or transmitter, no matter how low its power, it becomes a radio or telecom device and the EMCD ceases to apply, to be replaced by the provisions and conformity assessment procedures of the R&TTED. Of course, for conventional radio equipment this is easy enough to understand, but many manufacturers who have never before had anything to do with radio are taken aback when they learn just how wide the scope of this Directive is.

3.1 The implementation of the R&TTE Directive

The Radio & Telecommunications Terminal Equipment Directive (99/5/EC) [187] went into effect on 8th April 2000, with a transition period to 7th April 2001; after this date all equipment within its scope had to comply with its provisions. It is a development of the earlier telecoms equipment Directive, 98/13/EC. Included in its scope is all telecoms terminal equipment (TTE), and all radio equipment, and it supersedes the EMC Directive for this equipment – although the EMC requirements are maintained, so that on that score at least there is little change.

It represents a fairly fundamental shift in the way that radio and telecom equipment, previously subject to national and pan-European type approval regimes, is regulated. The goals which the R&TTE Directive addresses were, basically, simplified and relaxed procedures, minimum essential requirements, consistency with the EC's approaches and a responsiveness to market needs. These aspects had not been successfully addressed by the TTE Directive 98/13/EC and its predecessor 91/263/EC, partly because of differences in national implementation, and partly because of a burdensome conformity assessment regime and disproportionately severe essential requirements. There was also a lack of mutual recognition of the various national radio type approval regimes within Europe. The Commission saw these factors as stifling growth and innovation within the telecoms marketplace and the R&TTE Directive has been aimed at dealing with these issues.

Largely, the Directive has been successful in this, as witness the dramatic growth within Europe of both wired and wireless telecom systems. Furthermore, it has achieved this success apparently without an observed increase in interference problems between radio systems and without affecting the integrity of telecomms networks, suggesting that the earlier type approval regimes were indeed unnecessarily strict.

3.1.1 Scope

The main definitions defining the Directive's scope are:

- TTE (Telecommunications Terminal Equipment): a product or relevant component thereof, which is intended to be connected by any means whatsoever to interfaces of public telecommunications networks
- RE (Radio Equipment): a product or relevant component thereof, capable of communication by means of the emissions and/or reception of radio waves utilizing the spectrum allocated to terrestrial/space radio communications
- Radio waves: electromagnetic waves of frequency from 9kHz to 3000GHz, propagated in space without artificial guide
- Interface:
  i) a network termination point, that is, a physical connection point at which a user is provided with accesss to a public telecommunications network, and/or
  ii) an air interface, specifying the radio path between items of RE, and their technical specifications

Note that under the above definitions, a product can be both TTE and RE: a mobile phone or wireless LAN card, for instance. Explicit exceptions from the scope are:

- apparatus exclusively used for public security, defence, state security, and state activities in the area of criminal law;
- marine equipment, civil aviation equipment and air traffic management equipment (all covered by their own regulations);
- amateur radio equipment, broadcast radio receivers, and cabling and wiring.

3.1.1.1 Modules

The definitions of RE and TTE include the notion of a "relevant component". Therefore, any terminal equipment module or radio module, when placed on the Community market must comply with the essential requirements of the R&TTED. Such a module could for instance be a modem card for a PC, as TTE. Examples of radio modules are any component (IC, hybrid circuit, plug-in unit, etc), which together with an antenna, constitutes the transmitter RF circuit of a radio communications device, which has well defined RF parameters and which can clearly be identified. It is the responsibility of the manufacturer to declare if a product is a module. Modules which are not "placed on the market" are by default not covered by the Directive, though a finished product which uses one, is.

In the common case where a terminal equipment module or radio module is integrated into an otherwise non-R&TTE product, the person integrating the module becomes the manufacturer of the final product, and is therefore responsible for demonstrating its compliance with the essential requirements of the R&TTED. Assessed radio modules installed in equipment in conformance with the manufacturer's installation instructions require no further evaluation under Article 3.2 (effective use of spectrum, see 3.1.2.2) of the Directive and do not require further involvement of a Notified Body for the final product. In all other cases, or if the manufacturer of the final product is in doubt, then the equipment integrating the radio module must be assessed against Article 3.2 [204].

3.1.2 Requirements

There are three sets of essential requirements:

a) applying to both TTE and radio equipment:
   - the objectives with respect to the safety requirements contained in the Low Voltage Directive 73/23/EEC but with no lower voltage limit applying;
   - the protection requirements with respect to EMC contained in 89/336/EEC.

b) Radio Equipment shall effectively use the spectrum allocated to terrestrial or space radio communications and orbital resources so as to avoid harmful interference.

c) Essential requirements which may be applied at the Commission's discretion:
   - interworking via networks with other apparatus to allow connection to interfaces of the appropriate type throughout the EC;
   - prevention of harm to the network or misuse of network resources, that may cause an unacceptable degradation of service;
   - safeguards to ensure data protection and user privacy;
   - support of certain features to ensure avoidance of fraud;
   - support of certain features to ensure access to emergency services;
   - support of certain features to facilitate use by users with a disability.

3.1.2.1 Safety & EMC

The R&TTE requirements incorporate the safety requirements of the LVD and the EMC requirements of the EMCD. An important extension is the removal of the lower voltage limit (50V AC or 75V DC) for application of the LVD (73/23/EEC). This means that safety requirements apply even to handheld, battery powered apparatus.

For example, this calls for mandatory application of radiation limits to prevent hazard to human health, so that mobile handheld transmitters should be subject to a SAR (specific absorption rate, see section 1.4.1.2) assessment. And not just cellphones: there is a strong move towards applying such assessment to any radio transmitter, and even other types of electrical and electronic apparatus. Standards harmonized under both the R&TTE and Low Voltage Directives have been published for exactly this purpose. Such standards do not necessarily demand an actual test of emitted radiation, but there will be many circumstances where this is the simplest method of demonstrating conformity, even if not the cheapest. Whether such standards actually contribute to the protection of human health in a way that is proportionate to their cost of implementation is open to debate.

Because of the removal of the lower voltage limit, safety under the R&TTED extends beyond just an assessment of the mains supply to the apparatus. The threat of electric shock is only one aspect of safety: fire or other hazards due to batteries, for instance, may have to be considered.

The EMC requirements for TTE will normally be covered, as with other information technology equipment under the EMCD, by application of EN 55022, 55024 and 61000-3-2, as discussed in Chapter 4. Radio EMC is generally dealt with by the EN 301 489 series of standards, also mentioned in Chapter 4. These make allowance for semi-specific radio performance criteria and the application of exclusion bands around the transmit and receive frequencies.

3.1.2.2 *Effective use of spectrum*

Type approval of radio transmitters has been converted into the additional requirement for effective use of the spectrum so as to avoid harmful interference. This does not preclude national authorities from applying restrictions on the grounds of local spectrum management through the licensing process, but they must not attempt to enforce a type-approval regime in this context. The technical requirements for spectrum use include such parameters as transmitter power and frequency control, spurious emissions and responses of receivers, and occupied bandwidth. These requirements are detailed in harmonised ETSI standards for the more common types of radio equipment; the conformity assessment regime allows for the creation of "essential radio test suites" for those types of radio that are not covered, or inadequately covered, in harmonised standards, and this is intended to be one function of Notified Bodies as discussed in the next section.

The definition of an air interface refers to "technical specifications" of the interface; Member States are required to notify the Commission of the types of interface offered by public network operators, who in turn must publish interface specifications of a sufficient level to enable design of apparatus, and to allow manufacturers to carry out (if they so wish) relevant tests. At the time of writing, some six years after the inception of the Directive, this obligation has not been carried out by many Member States. A list of links to each country's published specifications and other documents is available on the Commission's website†, but the list is not complete, and by no means all of the links are in working order.

There is a requirement to inform the relevant national authorities whenever it is intended to place on the market equipment that uses non-harmonized spectrum allocations. The authorities then have a four-week period within which to raise objections.

3.1.2.3 *Further requirements*

The Directive also allows the Commission to impose extra requirements for certain classes of equipment, but to date this has not been applied. A particular requirement for terminal equipment is the prevention of harm to the network or its functioning, which causes an unacceptable degradation of service to persons other than the user of the apparatus. This aspect was traditionally handled by the type approval process. There were concerns that leaving the network requirement specifications hanging, as it were, in mid-air would damage the pan-European harmonization of the wired sector of the telecoms industry, but despite the continuing lack of availability of some Member States' network specifications in the public domain this does not seem to have become a serious issue.

The Directive is related to placing products on the market, and does not change the licensing and license exemption regimes in place in each Member State, which continue to be the mechanism for authorizing individual use of radio equipment.

3.2 The process of conformity assessment

Article 10.5 of the EMC Directive used to require radio transmitters (which may also be TTE, such as cellphone transmitters) to undergo EMC-specific type examination, which needed certification from a Notified Body. This was different from a Competent Body. With the entry into force of the R&TTE Directive, radio transmitters and

† http://ec.europa.eu/enterprise/rtte/weblinks.htm

receivers and TTE still follow different routes to compliance compared to other electronic apparatus, since they are complying with a different Directive.

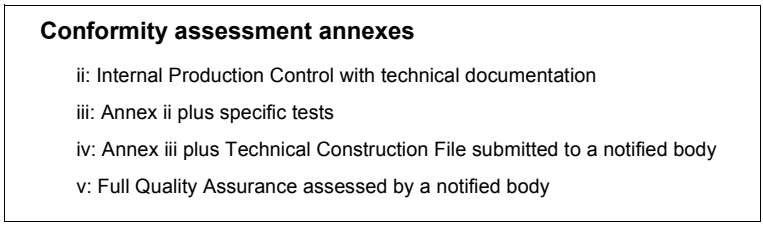

Figure 3.1 Compliance with the R&TTE Directive

3.2.1 Procedures

The conformity assessment procedures allowed under the R&TTE Directive are outlined in Figure 3.1 and Table 3.1. Their applicability varies depending on whether the equipment is telecoms terminal, or radio equipment; the receiving part of radio equipment is treated as telecoms equipment.

Table 3.1 Applicability of the conformity assessment procedures

Annex	Applicable to		Role of the Notified Body	Marking
	Without radio	With radio		
ii	Terminal equipment	Receivers		CE only
iii		Radio equipment including a transmitter complying with harmonised standards		
			Identification of the series of essential radio test suites	CE + NB number
iv	Terminal equipment	Radio equipment including a transmitter not complying or only partially complying with harmonised standards	Opinion on the conformity of the equipment based on a review of the manufacturer's TCF	
v	All equipment covered by the R&TTE directive		Certification of manufacturer's quality system	
The alert sign for Class 2 equipment must be indicated if a restriction on use applies to the equipment, and it must follow the CE marking				

Annexes ii and iii

Annex ii can only be applied to TTE and radio receivers, but it requires only that the manufacturer puts together technical documentation, using harmonised standards at his own option, to support his own declaration of conformity. This is equivalent to the

harmonised standards route in the original EMC Directive, and the EMC assessment method in the new EMCD. Annex iii applies to radio transmitters for which harmonised standards are available, in which case again the manufacturer applies these harmonised standards to support his own declaration. In some cases the harmonised standards will not include "essential radio test suites" and it is then the job of a Notified Body to identify these on a case-by-case basis, at the behest of the manufacturer. But it is not mandatory for the Notified Body to carry them out itself; the manufacturer can do this in any way he chooses, although the resulting CE Mark has to carry the identification of the Notified Body who specified the tests.

In either of the cases of annexes ii or iii, there is no absolute requirement for the involvement of a notified body in the *assessment* process. The specific tests in annex iii must be identified by a Notified Body unless they are already defined in the harmonized standard(s). But otherwise, these annexes represent pure self certification on the part of the manufacturer.

Annex iv

Annex iv involves the generation of a Technical Construction File, similarly to the mechanism of Article 10.2 in the original EMC Directive, which must then be assessed by a Notified Body. It is used for radio transmitters for which there are no harmonised standards, or for which harmonised standards have been only partly applied. It can also be applied to TTE instead of the Annex ii route. The TCF should contain similar documentation as for the earlier Annexes as well as the results of essential radio test suites (for radio transmitters) as agreed with the NB. The NB must issue an opinion within four weeks of receipt of the TCF; after these four weeks are up, or once he has received the opinion, the manufacturer can place the product on the market.

Annex v

The Full Quality Assurance method of Annex v may be an attractive route for a large manufacturer of radio equipment, since it is the only option that avoids the case-by-case involvement of a notified body for radio terminals whose tests are not defined in harmonized standards. Instead, the NB assesses the manufacturer's own QA system for design, manufacture and final product inspection and test.

It must be appreciated that in all cases it is the manufacturer's responsibility to ensure the product complies and to declare accordingly. Where an NB is used it has no power to *prevent* a product being marketed. Even with the Annex iv TCF mechanism, the NB only issues an opinion, but it is the manufacturer who makes the final decision on compliance. Clearly, a manufacturer will be taking a risk if he goes against an NB's opinion; the risk will be defined by his view of the likelihood of suffering a serious non-compliance versus the effectiveness of enforcement action.

It has to be said that in fact, leaving aside the Annex iii process of specifying essential radio tests, which are in any case ill-defined, the actual experience of the Annex iv route has been almost opposite to that intended. Many smaller manufacturers, confused by the way in which they are forced into taking a responsibility for which they are ill-prepared and poorly briefed, will happily accept guidance from an authority who appears to be familiar with the system and who moreover is designated for that purpose – in the case of the UK, authorized by the accreditation agency UKAS, on behalf of the government. And who just happens to have laboratory testing as its main business activity. This leads to the situation described by one commentator as follows [45]:

> ... the unexpected effect is that lack of clarity has led to opportunity for commercial exploitation and a side-lining of established accreditation. We end up with a situation where "notification"

is of greater commercial value than "accreditation" and the norms for accreditation are flexed on an ad-hoc national basis for regulatory purposes. All too often, the de-facto scenario becomes third party certification by notified bodies in the guise of "opinions" based on testing they themselves have performed! This lack of rigour in the notified body world begins to undermine confidence not only in their activities but also in the expected reliance on simple manufacturers' declarations against harmonised standards as the main route to compliance.

3.2.2 Classes of radio transmitter

The Commission Decision of 6 April 2000 (2000/299/EC) [188] established two classes of equipment under the R&TTED:

- Class 1 equipment: Radio Equipment and TTE which can be placed on the market and be put into service without restrictions;
- Class 2 Radio Equipment: All Radio Equipment not falling into the definition of Class 1.

Class 1 equipment does not have a separate identifier: just the CE Mark (perhaps with a Notified Body number) is all that is needed. Class 2 equipment must be additionally marked with an "equipment class identifier" which has the same height as the initials "CE". This "alert symbol" is an exclamation mark in a circle: 

In order to decide whether they have to comply with this requirement, manufacturers need to know what equipment falls into what class. Class 1 is divided by the Commission into a number of sub-classes of which sub-classes 1 to 6 and 8 are varieties of TTE:

- Sub-class 1. ISDN (ISDN Basic Rate, ISDN Primary Rate, ISDN U, Broadband ISDN ATM);
- Sub-class 2. PSTN (Analogue single line, Analogue multi-line (with/ without DDI), equipment attached to Centrex interfaces or Virtual Private Networks);
- Sub-class 3. Leased lines (2w and 4w analogue (baseband), 2w and 4w analogue (voiceband), Digital, SDH, optical);
- Sub-class 4. Wired data equipment (X.21, X.25, ethernet, token ring, token bus, TCP/IP, frame relay);
- Sub-class 5. Wired interactive broadcast equipment (unswitched vision/ sound, switched vision/sound);
- Sub-class 6. Telex (single line equipment, multiple line equipment);
- Sub-class 7. Receive-only radio equipment;
- Sub-class 8. Other terminal equipment attached to fixed networks.

Higher sub-classes refer to various radio transmitters. The ERO (the European Radiocommunications Office) in Denmark maintains a list on its website, along with a tool called EFIS which gives the basic technical description of each type of apparatus represented in a sub-class. Table 3.2 shows a summary of these sub-classifications published as at summer 2006; consult the website† for a more up-to-date listing.

† http://www.ero.dk/rtte

Table 3.2 Sub-classes for Class 1 Radio Equipment

Sub-classes	Frequency bands	Service
9	890–915/935–960 MHz 880–890/925–935 MHz 876–880/921–925 MHz 1710–1785/1805–1880 MHz	GSM, GSM-R
11, 12	1525.0–1544.0 MHz 1555.0–1559.0 MHz 1631.5–1634.5 MHz 1656.5–1660.5 MHz 10.7–11.7 GHz 12.5–12.75 GHz 14.0–14.25 GHz	Land Mobile Earth Stations
13	380–385 MHz 390–395 MHz	TETRA
14, 15	1610–1613.5 MHz 1613.8–1626.5 MHz 2483.5–2500 MHz 2483.5–2500 MHz 1980–2010 MHz 2170–2200 MHz	Satellite-Personal Communications (PCN) Earth Stations
16	1525.0–1544.0 MHz 1555.0–1559.0 MHz 1626.5–1645.5 MHz 1656.5–1660.5 MHz	Land Mobile Satellite Service
18	1880–1900 MHz	DECT
19, 20, 21, 25, 28, 29, 30, 31, 43	40.665 MHz, 40.675 MHz, 40.685 MHz, 40.695 MHz 433.05–434.79 MHz 2400–2483.5 MHz 26.995 MHz, 27.045 MHz, 27.145 MHz, 27.195 MHz 868.0–868.6 MHz 868.7–869.2 MHz 869.4–869.65 869.7–870 MHz 5725–5875 MHz	Non-specific Short Range Devices
22	2400–2483.5 MHz	Wideband Data Transmission Systems including RLANs
24, 36, 37, 38, 39, 40, 41, 42, 44, 45	13.553–13.567 MHz 20.05–59.75 kHz 59.750–60.250 kHz 60.250–67 kHz 67–70 kHz 70–119 kHz 119–127 kHz 127–135 kHz 6765–6795 kHz 7400–8800 kHz	Inductive applications

Table 3.2 Sub-classes for Class 1 Radio Equipment (Continued)

Sub-classes	Frequency bands	Service
26, 27	2446–2454 MHz 24.15–24.175 GHz	Movement Detection
32, 33, 34	868.6–868.7 MHz 869.25–869.3 MHz 869.65–869.7 MHz	Alarms
35	869.2–869.25 MHz	Social Alarms
46	863–865 MHz	Radio Microphones
47	402–405 MHz	Ultra Low Power Active Medical Implants
48	863–865 MHz	Wireless Audio
49	457 kHz	Avalanche Victims
50	76–77 GHz	Road Transport & Traffic Telematics (RTTT)
51	446.0–446.1 MHz	PMR446

3.2.3 Notification

If a radio product uses a frequency band or bands which is not harmonised throughout the EC, the manufacturer has to notify any Member State's national authority of their intention to place the equipment on the market in their country. Member States have the authority to prohibit the placing on the market, or to withdraw from the market, radio equipment which they consider has caused or is likely to cause harmful interference.

The person responsible must notify their intention at least four weeks before the equipment is first placed on the national market. The notification must include information on the radio characteristics such as operating frequency, channel spacing, modulation, RF power and so on. The notification form has to be sent to the responsible national authority. In the UK, the responsible authority is Ofcom, who accept notifications by e-mail; other administrations do the same.

One practical difficulty with the notification requirements is for manufacturers to know, for any given equipment, whether a notification is required or not. The information needed on the use of frequencies has to be provided by many different administrations spread across the EC. Manufacturers would find it difficult to compile this information, and so a mechanism is needed to allow manufacturers to discover when notifications are not required. Details of the technologies for which harmonised frequency bands are available are maintained by ERO (see Table 3.2 above), and can be accessed via the internet from the ERO website.

In the UK, Ofcom's position is that it will alert manufacturers when they intend marketing products in the UK that cannot be legally used. In the vast majority of cases an alert to the manufacturer will be all that is necessary. It will then be the manufacturer's responsibility to provide the necessary warning to its customers on the equipment packaging and instructions for use. But, manufacturers should not rely on the notification procedure to identify countries where equipment can and cannot be legally used or licensed. Administrations have no obligation under the Directive to respond to a notification: lack of response does not mean acceptability.

3.2.4 Information requirements

Where Radio Equipment is involved, the packaging and user instructions must identify the Member State or geographical area within a Member State where the apparatus is intended to be used. In addition, the marking on Radio Equipment must warn the user that there may be restrictions of use of the apparatus in certain Member States, using the alert symbol shown in section 3.2.2; on TTE it should indicate the interfaces of the networks to which the equipment is intended to be connected.

Unlike the EMC Directive, which requires the manufacturer to make a Declaration of Conformity but only mandates its availability to enforcement officers, the R&TTED requires that the D of C is provided to the user. This can be either a full (multilingual) copy, or an abbreviated version:

> Hereby, [Name of manufacturer], declares that this [type of equipment] is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

as long as the abbreviated version is accompanied by details of how to obtain a copy of the D of C, or by a copy of the actual D of C in the language of the manufacturer.

3.2.4.1 Indication of the intended use of the equipment

It may seem obvious, but the R&TTED requires that the user must be provided with information on the intended use of the apparatus. The Commission envisages that this could be done in a number of ways:

- written description: e.g. cordless telephone with answering machine, Garage door remote control;
- description in visual form: illustration on the packaging, photo in the user manual, pictogram, equipment visible through the packaging;
- by the use of terms known to the public: e.g. baby monitor, modem, PMR, GSM terminal, etc.

If the description is in written form, it has to be in the official language(s) of the region in which the equipment is placed on the market. For a multilingual region this means all languages. Since the EC is multilingual, and since most suppliers want market access to the EC as a whole, this explains the preponderance of pictograms.

3.2.4.2 Countries where the equipment is intended to be used

As above, this information can be presented in written form, as a pictogram, or in abbreviated fashion using the following two-letter country identifiers (from ISO 3166):

Austria	AT	Malta	MT
Belgium	BE	Netherlands	NL
Cyprus	CY	Poland	PL
Czech Republic	CZ	Portugal	PT
Denmark	DK	Slovakia	SK
Estonia	EE	Slovenia	SI
Finland	FI	Spain	ES
France	FR	Sweden	SE
Germany	DE	United Kingdom	GB

Greece	GR	Iceland	IS
Hungary	HU	Liechtenstein	LI
Ireland	IE	Norway	NO
Italy	IT	Switzerland	CH
Latvia	LV	Bulgaria	BG
Lithuania	LT	Romania	RO
Luxembourg	LU	Turkey	TR

3.2.5 Marking of equipment and documentation

The requirements for marking under the R&TTED are rather more involved than just the simple CE mark as is used for other Directives. There are inconsistencies between it and other Directives in respect of administrative requirements.

3.2.5.1 General requirements

Annex vii of the Directive requires of the CE Mark:

> The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.

The word "additionally" here distinguishes this Directive from other CE Marking Directives, which allow affixing *either* to the product *or* to its documentation and packaging. This single requirement is responsible for more non-compliances with the Directive than any other, since it is so easy to overlook.

Extra requirements in this Directive are the need for an identification number for the Notified Body used in Annexes iii, iv and v; and the need for the Class 2 equipment class identifier (the exclamation mark in a circle) for equipment subject to restrictions on use. It's also a requirement that the equipment itself shall be identified, with the model, manufacturer's name and serial or batch number.

3.2.5.2 Equipment containing an R&TTE component

According to the Commission's guidance, equipment containing an R&TTE component must be marked in the following way:

- Equipment, which at the time of placing on the market contains as an integral part an R&TTE component, which should not be removed by the user, should be marked according to the R&TTE Directive. In addition, in its user manual it should declare compliance with the R&TTE Directive and if necessary indicate geographic limitations of use;
- Equipment, which provides for the capability that users insert R&TTE components, but in themselves are not covered by the R&TTE Directive (e.g. laptop computers) should not be marked according to the R&TTE Directive.

By "marking according to the R&TTE Directive" it is understood that this Directive does apply. So, for example, a laptop with an integral wireless modem falls under the R&TTED, but a laptop with no wireless connectivity does not, even though a plug-in wireless modem card could be inserted. Such a card should itself be declared under the R&TTED.