



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**Q.440**

**SPECIFICATIONS OF SIGNALLING SYSTEM R2  
INTERREGISTER SIGNALLING**

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**GENERAL**

**ITU-T Recommendation Q.440**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation Q.440 was published in Fascicle VI.4 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.

4.1 GENERAL

Interregister signals are of the multifrequency type using a 2-out-of-6 in-band code in both directions. The multifrequency combinations are sent and received by multifrequency signalling equipment which is assumed to be associated with the registers used to control the switching equipment at both ends of the inter-exchange link.

4.1.1 End-to-end signalling method

In System R2 interregister signalling is generally performed end-to-end by a compelled procedure between the outgoing register and the incoming registers which come into action one after another. Signalling takes place over one or more links in tandem without signal regeneration in intermediate exchanges. With this signalling method only the address information needed for routing the call through an intermediate exchange is transferred from the outgoing register to the incoming registers. In an intermediate exchange the speech path is immediately through-connected and the incoming register released, then the outgoing register can exchange information directly with the incoming register of the next exchange (see Figure 11/Q.440). If any intermediate exchange has to carry out charging operations, additional address information can be transferred from the outgoing register to the incoming register of that exchange as required.

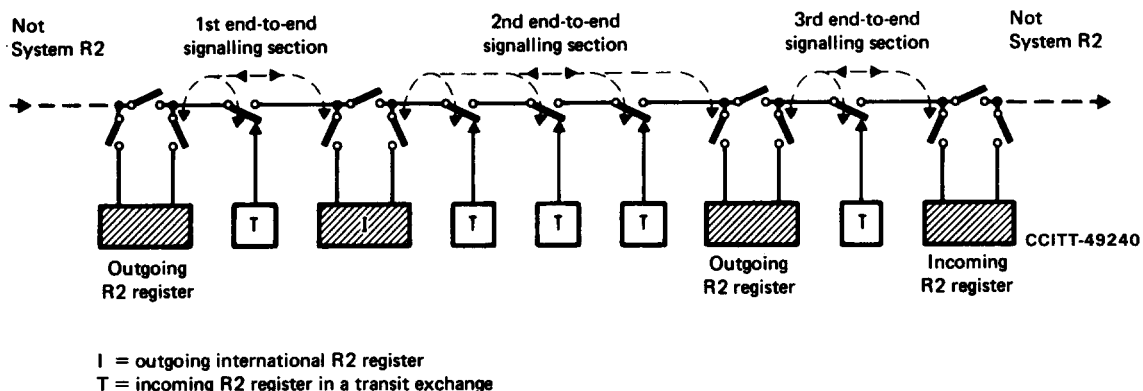


FIGURE 11/Q.440  
An international three-section multi-link connection

In circumstances where transmission conditions do not comply with the requirements specified for System R2 (see Recommendation Q.457) or where System R2 is used in a satellite link, and thus the exchange of the interregister signals over the complete System R2 connection is not permitted, the overall multi-link connection is divided into end-to-end signalling sections. When the number of multifrequency combinations available is not the same on all parts of the connection, the division should be made at an exchange between links having different numbers of multifrequency combinations to improve the transfer of information.

The outgoing R2 register is situated at the outgoing end of a signalling section on which System R2 interregister signalling according to the present specifications is used. It controls the call set-up over the whole signalling section. It sends forward interregister signals and receives backward interregister signals.

The outgoing R2 register receives information via the preceding links of the connection in a form used by the signalling system applied over the last of these links; this system may be System R2, a decadic pulse system, or any other system. The preceding link may also be a subscriber's line. When an R2 register in a transit exchange is working according to this definition, it is also called an *outgoing R2 register*.

Special cases of the outgoing R2 register are the outgoing international R2 register (see § 4.1.2) and the outgoing R2 register at the incoming end of a satellite link.

The incoming R2 register is situated at the incoming end of a link on which System R2 multifrequency interregister signalling according to the present specification is used. It receives forward interregister signals via the preceding link(s) and sends backward interregister signals. The information received is used completely or in part for the control of selection stages and may be sent in its entirety or in part to the succeeding equipment, in which case the signalling used for retransmission is never System R2. Interworking then takes place between System R2 and the other

system. Thus every register not situated at the outgoing end of a System R2 signalling section is called an *incoming R2 register* independently of the exchange type.

The term *incoming R2 register* may be applied also to devices controlling one or more selection stages, for example *markers* etc. It should be noted that in such equipment no provision is made for further transfer of the information received.

#### 4.1.2 *International end-to-end working*

The inclusion of a special *outgoing international R2 register* as shown in Figure 11/Q.440 is dictated by a number of considerations. An outgoing international R2 register is an outgoing R2 register which controls the call set-up on a signalling section which comprises at least one international link and possibly national links in tandem.

Even when System R2 is used in the national network of the originating country an outgoing international R2 register must always be provided in the country of origin to divide the connection into two signalling sections for the following reasons:

- to prevent the maximum number of links in a signalling section over which System R2 can function from being exceeded on international calls;
- to permit the use of fewer signalling frequencies in the country of origin (e.g. 5 forward and 5 or 4 backward signalling frequencies);
- to enable non-standardized meanings to be allocated to the spare national multifrequency combinations for use solely in the country of origin;
- to provide criteria for distinction, at the incoming end, between national and international calls;
- to have the facilities for routing and charging of international calls concentrated in one place if it is more economical than to equip every normal outgoing R2 register to perform these functions.

In general the outgoing international R2 register is situated at the outgoing international exchange. However, it may be situated in a national exchange preceding the international exchange provided that the transmission requirements specified are fulfilled.

End-to-end signalling from the outgoing international R2 register can be extended beyond the incoming international exchange even if a reduced number of signalling frequencies is used. However, such international/national end-to-end signalling requires:

- that the transmission conditions in the national destination network comply with the System R2 specifications, and
- that the routing principles employed in the national destination network are compatible with the System R2 signalling procedures for end-to-end transmission of address digits from the outgoing international R2 register to an incoming R2 register in a national exchange.

#### 4.1.3 *Register requirements*

Apart from signalling procedures specified in Section 5 the following characteristics of R2 registers are specified.

##### 4.1.3.1 *Outgoing R2 registers*

The multifrequency signalling equipment associated with outgoing R2 registers in national exchanges may be of the 2-wire or 4-wire type (see Recommendation Q.451).

The multifrequency signalling equipment associated with outgoing international R2 registers must be of the 4-wire type. This is dictated by transmission constraints (see Recommendation Q.452).

The outgoing R2 register controlling a given multi-link signalling section must be able to recognize at least all the backward signals used on that section.

The outgoing international R2 register must be able to send all 15 forward multifrequency combinations with the meanings specified for international working. It must be able to receive all 15 backward multifrequency combinations and act upon the received information in the specified manner. In the case when System R2 is used on the preceding link the calling party's category signals have to be translated by the outgoing international R2 register as specified (see Recommendation Q.480).

The outgoing R2 register must start call set-up as soon as it has received the minimum requisite information. Therefore signal transfer starts before the complete address information is received, i.e. before the caller finishes dialling. This *overlapping interregister signalling* particularly applies at an outgoing R2 register where the complete address information from a subscriber or operator is stored (e.g. local registers). This is in contrast to *en bloc register signalling* i.e. the transmission of all the address information as a whole in one sequence starting only after the complete reception of the address information.

#### 4.1.3.2 *Incoming R2 registers*

The multifrequency signalling equipment associated with incoming R2 registers may be of the 2-wire or 4-wire type (see Recommendation Q.451).

The multifrequency signalling equipment associated with the incoming R2 register in an international exchange must be of the 4-wire type and equipped to send and receive all 15 multifrequency combinations.

Every incoming R2 register in a multi-link signalling section must be able to recognize at least the forward signals used on that section and directed to that register.

#### 4.1.4 *System R2 compelled signalling method*

The compelled signalling operates as follows (see Figure 12/Q.440):

- on seizure of a link, the outgoing R2 register automatically starts sending the first forward interregister signal,
- as soon as the incoming R2 register recognizes this signal, it starts sending a backward interregister signal which has its own meaning and at the same time serves as an acknowledgement signal;
- as soon as the outgoing R2 register recognizes the acknowledging signal, it stops sending the forward interregister signal;
- as soon as the incoming R2 register recognizes the cessation of the forward interregister signal, it stops sending the backward interregister signal;
- as soon as the outgoing R2 register recognizes the cessation of the acknowledging backward interregister signal it may, if necessary, start sending the appropriate next forward interregister signal.

When the duration of the forward and backward signals is not controlled by the compelling mechanism described above, it is either limited by the time-out delay for release of the register or determined by the nature of the pulse imposed on them (see Recommendation Q.442).

Figure 12/Q.440 shows a basic compelled signalling cycle.

Figure 18/Q.457 shows in detail the build-up and time sequence of a compelled signalling cycle, including the operating and release times of multifrequency signalling equipment and other internal operating times of exchange equipment.

Besides being a functional part of the compelled procedure, the acknowledging backward signals serve to convey special information concerning the required forward signals, to indicate certain conditions encountered during call set-up or to announce switchover to changed meanings of subsequent backward signals. Changeover to secondary meanings allows information concerning the state of the called subscriber's line to be transferred (see Recommendation Q.441, § 4.2.4). Therefore a choice of acknowledging backward signals is provided.

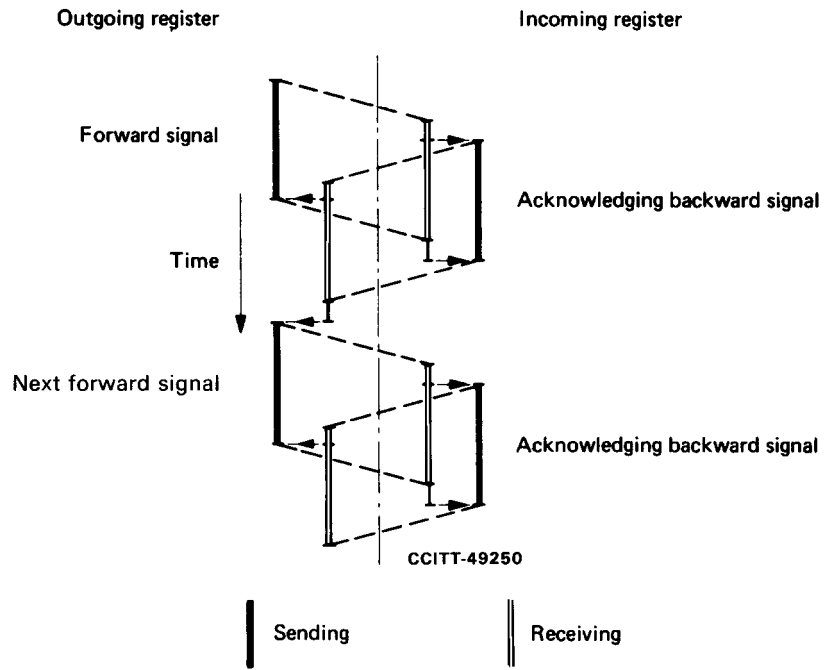


FIGURE 12/Q.440  
Compelled signalling cycle