

3 Operation Modes and Signalling Protocols

3.1 RIM Operational Modes

The RIM is capable of connection to the PSTN via the following methods:

- ▶ Non-integrated access mode (analogue VF interfaces). Non-integrated access is supported by all releases of RIM and C-RIM.
- ▶ Integrated access mode (2 Mbit/s digital interfaces). Some integrated protocols support concentration.
 - Fully integrated access is supported by traditional RIM Release 2 or later.
 - C-RIM does not support fully integrated access.
- ▶ Partially-integrated access mode (a mixture of integrated and non-integrated services). Partially integrated access is supported by all releases of RIM and C-RIM with the exception of Release 1.

3.1.1 Non-Integrated Access Mode

In non-integrated access, RIM is transparent to the switch VF interface, operating as a service extender. RIM interfaces to the switch VF interface via exchange interface cards. It multiplexes these dedicated subscriber services onto a bearer. At the RU it demultiplexes these dedicated services before connecting to the subscriber.

When operating in non-integrated access mode, the RU channel units are mirrored at the EU so that every customer line at the remote end has a corresponding physical connection at the EU end.

A variety of different channel units allow a range of customer services including:

- ▶ POTS.
- ▶ Payphones.
- ▶ Indial.
- ▶ Step by step.
- ▶ Securitel.
- ▶ Unbalanced feedbridge.
- ▶ E & M signalling.
- ▶ Leased lines.

- ▶ 50 Hz metering detection.
- ▶ 12 kHz metering.
- ▶ ISDN – 4B3T and 2B1Q.
- ▶ DDN – 64 kbit/s.
- ▶ 4/6 Wire.
- ▶ Data services.
- ▶ P–Phone.

3.1.2 Integrated Access Mode

In integrated access mode, the RIM provides access to the parent switch via a 2 Mbit/s digital interface. When in integrated mode, the EU does not demultiplex the 2 Mbit/s G.703 signals from the RU any further.

When operating in integrated access mode, channel units at the RU are connected via the EU to 2 Mbit/s digital interfaces to the switch via one of the integrated protocols.

One advantage of integrated access is the reduced cost, as channel units are not required in the EU. In addition, the ARK–P, RSU and V5.2(–) protocols allow concentration of services.

Details of concentration are in Section 3.1.4.

RIM can interface to a variety of switch technologies (and support concentration in some cases) using the following integrated protocols:

- ▶ RSU: Alcatel System 12 interface (integrated and concentrated)
- ▶ ARK–P: Ericsson AXE interface (integrated and concentrated)
- ▶ ESM: Ericsson AXE interface utilising extended services module (ESM) equipment (integrated only)
- ▶ V5.2(–) Ericsson AXE with V5.2(–) interface (integrated and concentrated)

For further information regarding the services supported by each of the above protocols refer to the table of integrated signalling protocols on page 3–8.

Note *In C–RIM OA&M is carried by the NUB of the first 2Mbit/s bearer, which is associated with the PCMCC. This bearer must be Non–integrated, and accordingly C–RIM cannot be Fully Integrated*

3.1.3 Partially Integrated Mode

RIM can support the combination of the non-integrated and integrated modes. The valid combinations of protocols are as follows:

Architecture	Access Mode	Protocols				
		Non Integrated	ESM	ARK-P	RSU	V5.2(-)
RIM	Non Integrated	Y				
			Y			
	Fully Integrated			Y		
					Y	
						Y
	Partially Integrated	Y	Y			
		Y		Y		
		Y			Y	
		Y	Y	Y		
		Y	Y		Y	
C-RIM	Non Integrated	Y				
	Partially Integrated	Y	Y			
		Y			Y	
		Y				Y
		Y	Y		Y	
		Y	Y			Y

Note

- [1] The protocols supported vary with different releases of traditional RIM and C-RIM. Section 3.2 lists the protocols supported by the each release.
- [2] The first bearer in a C-RIM system must be non-integrated as OA&M is carried in the NUB of this bearer.

3.1.4 Concentration

The RIM uses an advanced concentration controller to manage concentrated services. With concentration, the total number of trunk circuits is less than the total number of subscriber circuits. The concentration controller is responsible for the allocation of the trunk circuits.

The concentration ratio is determined by the number of subscribers using integrated access and the number of integrated access bearers. The relationship is:

$$\text{Concentration Ratio} = \frac{\text{Number of Integrated Subscribers}}{(\text{Number of Integrated 2 Mbit/s Streams}) \times 30 \text{ (TS)}}$$

The concentration ratio can vary from 16:1 (480 subscribers with one integrated 2 Mbit/s stream) to 1:1 (480 subscribers with 16 integrated 2 Mbit/s streams).

If, for example, 2 x 2 Mbit/s streams are used, this represents a concentration ratio of 8:1 for 480 lines.

The trunk allocation strategy ensures that the concentration function is implemented in an entirely non-blocking form, such that all subscribers have access to all 2 Mbit/s streams. This means that the failure of an integrated bearer simply results in an increase in the concentration ratio.

3.2 Integrated Signalling Protocols

Traditional RIM and C-RIM can support a range of Integrated signalling protocols. They are as follows:

- ▶ RSU (Alcatel 1000 System 12)
- ▶ ARK (Ericsson AXE)
- ▶ ESM (Ericsson AXE)
- ▶ V5.2(–) (Ericsson AXE)

The RIM incorporates an advanced Specification and Description Language (SDL) engine which allows the rapid deployment of new services and protocols.

The available protocols vary for particular releases, as shown in the table below. Release features are described in Section 4.4.

Release	Non Integrated	Integrated			
		ESM	ARK–P	RSU	V5.2(–)
1	Y				
2	Y		Y		
3	Y		Y		
3.1	Y	Y	Y		
4	Y			Y	
6.1	Y	Y		Y	
7.1	Y	Y			
8.0	Y	Y		Y	Y
8.2	Y	Y		Y	Y

3.2.1 Alcatel 1000 System 12 Interfaces

The RIM has been designed to interface with the Alcatel 1000 S12 switch via the RSU Common Channel Signalling protocol.

When using the RSU protocol, RIM emulates an IRSU (ISDN Remote Subscriber Unit) of System 12. It integrates to System 12 over up to 4 x 2 Mbit/s G.703 bearers using HDLC common channel signalling concentrating protocol.

For an RSU services summary, refer to the table on page 3–8.

Support for integrated services depends on the protocol being used. The services available for concentrated RIM integrated protocols are summarised in the table on page 3–8.

3.2.2 Ericsson AXE Interface

The ARK–P, ESM and V5.2(–) protocols allow RIM to integrate into Ericsson's AXE switches.

(1) ARK–P (ARK–Parenting Protocol)

This protocol uses Channel Associated Signalling (CAS) between the parent switch and the RU to signal outgoing and incoming calls. Two types of signalling can be used depending on the bearer and switch being used. These are:

- ▶ T signalling which is a one bit protocol used for multiplexed analogue bearers (FDM).
- ▶ T6 signalling which is a two bit protocol used for physical line bearers (loopmuxes) and/or for switches already equipped for this signalling type.

ARK–P is a concentrating protocol and offers the services summarised in Table 3–1.

(2) ESM

This protocol is non–concentrating and interfaces to AXE switches via an extended services module. Being non–concentrating means that individual subscribers have a dedicated trunk circuit back to the switch.

Table 3–1 summarises the services available with ESM protocol.

(3) V5.2 (–)

V5.2(–) is a single link concentrating protocol which uses HDLC Common Channel Signalling (CCS) protocol between the Local Exchange (LE) and the RU to signal outgoing and incoming calls and services. The HDLC controllers are provided on the ICC Unit.

Up to eight single link V5.2(–) interfaces are supported in Release 8.x. Customers can be assigned to any of the eight interfaces, however a customer's access is limited to the single link supporting that interface.

V5.2(–) is specifically for use with Ericsson AXE exchanges. It is not a full implementation of V5.2 but has reduced functionality for achieving interworking with an AXE exchange.

- ▶ Control, PSTN and Concentration are supported by Releases 8.0 and 8.2.
- ▶ Link Control is supported by Release 8.2 but not by Release 8.0.
- ▶ Protection is not supported.

V5.2(–) offers the services summarised in Table 3–1.

3.2.3 Integrated Services Summary

Integrated services are available on POTS and UNIV units. Release 8.2 also supports Integrated ISDN 2B1Q access for V5.2(–) protocol only.

Service/Feature	ARK–P		ESM	RSU	V5.2(–)
	ARK–T	ARK–T6			
Concentrating	Yes	Yes	—	Yes	Yes
Standard POTS	Yes	Yes	Yes	Yes	Yes
Fully Easycall	—	—	Yes	Yes	Yes
Payphone	Yes	Yes	Yes	Yes	Yes
50 Hz and 12 kHz meter	Yes	Yes	Yes	Yes	Yes
Long line	Yes	Yes	Yes	Yes	Yes
Reverse on idle	Yes	Yes	Yes	Yes	Yes
Reversal on answer	Yes	Yes	Yes	Yes	Yes
Unbalanced feed	Yes	Yes	Yes	Yes	Yes
ISDN	—	—	—	—	Yes ^[1]

^[1] Integrated ISDN support only in Release 8.2.

Table 3–1 Integrated Services Summary