

4 System Configuration

4.1 Overview

RIM Releases 1, 2, 3, 3.1, 4 and 6.1 are all based on the same hardware architecture, the traditional RIM architecture.

Compact RIM (C-RIM) is a new architecture used in Releases 7.1, 8.0 and 8.2. It provides the same customer services as traditional RIM but with reduced hardware requirements.

4.2 Traditional RIM Architecture

This section covers the traditional architecture referred to as RIM. For details of the C–RIM compact architecture, refer to Section 4.3.

4.2.1 Panel Overview

Typically, access products consist of three main functional blocks: transmission, system control and customer interface. In the RIM, these main functions are implemented across a number of panels located at the EU and RU as described below.

EU panels are located at the exchange and are mounted in racks, while RU panels are either mounted in racks in an internal remote building or mounted in a RIM housing.

Access Panel

- ▶ Provides subscriber and non–integrated exchange interfaces.

Common Panel

- ▶ Provides control, clock generation/distribution and OA&M access functions.

Line Transmission Panel

- ▶ Provides a transmission system between the Remote Unit and the Exchange Unit.

Ring/Meter Panel

- ▶ Generates ring supply, 50 Hz & 12 kHz signals, –100V DC battery for ISDN and Long Lines at the RU. Also required at the EU for reverse POTS and outdoor extensions.

Trunk Interface Panel

- ▶ Provides an optional interface between the Common Panel and the Line Transmission Panel at the RU.

The panel usage is described in Table 4–1.

Table 4–1 Panel Types and Functions – RIM

Function	Panel Type	RIM EU	RIM RU
Transmission	Line Transmission	Yes*	Yes*
	Trunk Interface		[1]
System Control	Common	Yes	Yes
Customer Interface	Access	[2]	Yes
	Ring/Meter	[3]	Yes

[1] Required for integrated/concentrated applications, optional for non–concentrated applications

[2] Required for non–integrated applications

[3] Required for indial services at EU

* Not required if external transmission equipment used

4.2.2 Panel Layouts

(1) Exchange Unit Layout

The RIM Exchange Unit provides the interfacing function between the RIM Remote Unit and the parent switch. It is installed in Type-84 and 92 racks and located indoors at the exchange site.

* Optional.
External transmission
system may be used

P&ADP = , Power & Alarm Distribution Panel
LTP = Line Transmission Panel
CP = Common Panel
AP = Access Panel

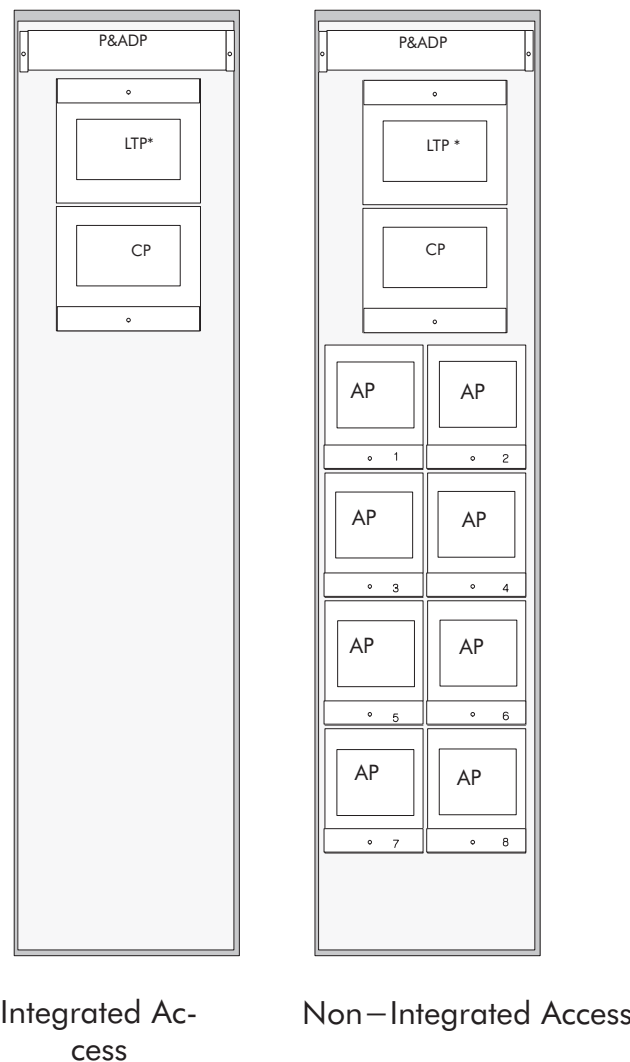


Figure 4-1 Typical RIM EU Rack Layouts

The configuration of the EU will vary depending on the exchange-end access requirements. The connection mode to the network via the EU may include one or both of:

- ▶ Integrated Access.
- ▶ Non-integrated Access.

Integrated Access

Integrated Access is used for switched VF services that terminate on a 2048 kbit/s IDN switch with only the following panels required:

- ▶ Line Transmission (optional).
- ▶ Common.
- ▶ Power and Alarm Distribution.

Non-integrated Access

Non-Integrated Access is used for:

- ▶ Switched VF services which terminate on VF switch access. ports. In this mode switched VF services are not concentrated.
- ▶ Other services such as data and leased lines.

For non-integrated access, Access Panels mirroring those at the RU are required at the EU in addition to the panels listed above for integrated access.

Normally the Ring/Meter Panel is not required at the EU. It is possible to connect an external ring source to the EU Access Panels, to support reverse POTS services.

(2) Remote Unit Layout

The Remote Unit houses all the panels that connect to the EU and customer services.

The RU equipment can be located:

- ▶ Indoors, in a pre-cabled Type 84 or 92 rack.
- ▶ Outdoors, in the Remote Housing.

See the Housing Outline on page 4-8

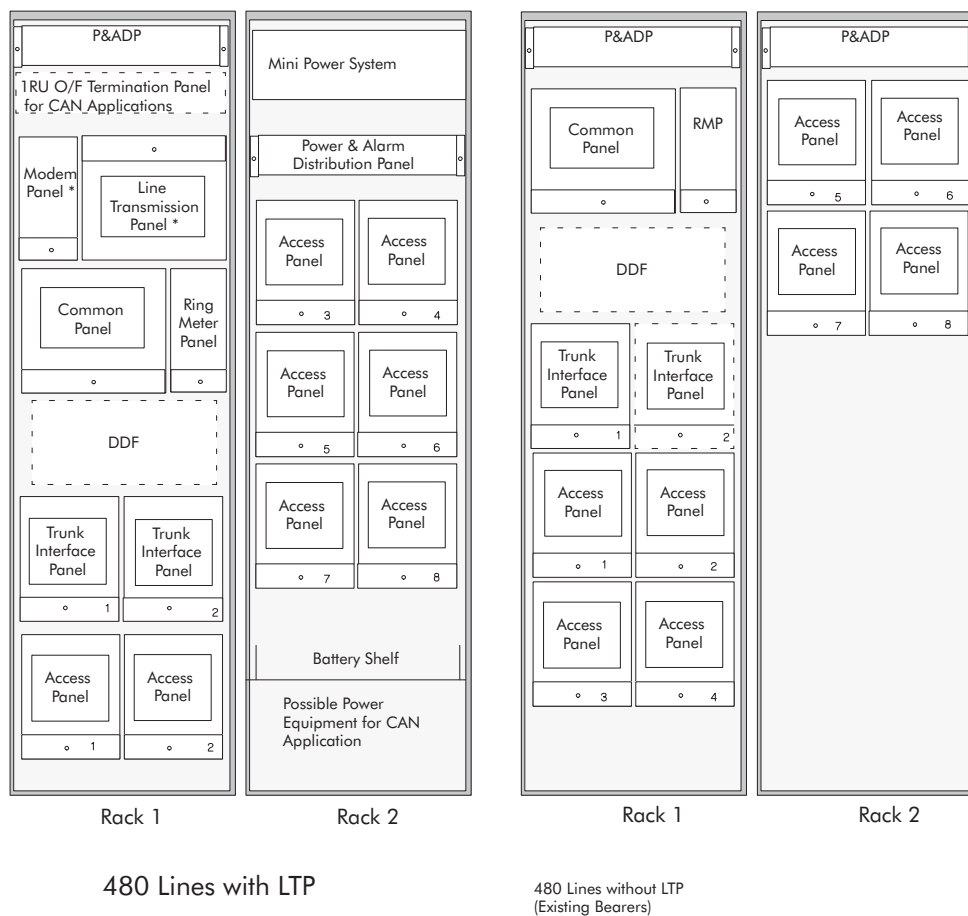
The major sub-systems of the RU are:

- ▶ Access Panel.
- ▶ Common Panel.
- ▶ Line Transmission Panel (optional).
- ▶ Trunk Interface Panel (optional).
- ▶ Climate Control System (for housing installations).
- ▶ Power sub-system (for housing installations).
- ▶ Ring/Meter Panel.

See the *Typical RIM RU Indoor Panel Layouts* on page 4-7 and the *Typical RIM 480 Line RU Housing Layout* on page 4-8.

RIM Indoor Remote Unit Layout

The diagram below shows some typical panel layouts for remote indoor systems. Panel layouts vary according to their application.



* Modem Panel may be used for analogue transmission in lieu of Line Transmission Panel

Figure 4–2 Typical RIM RU Indoor Panel Layouts

480 Line 1G Remote Housing Layout

The 480 Line 1G Remote Housing contains the RU equipment for an outdoor location. For services, it can house eight Access Panels providing the maximum 480 POTS lines capacity.

It has three separate compartments:

- ▶ Cross Connect Compartment (CCC).
- ▶ Main Equipment Compartment (MEC).
- ▶ Power Compartment (PC).

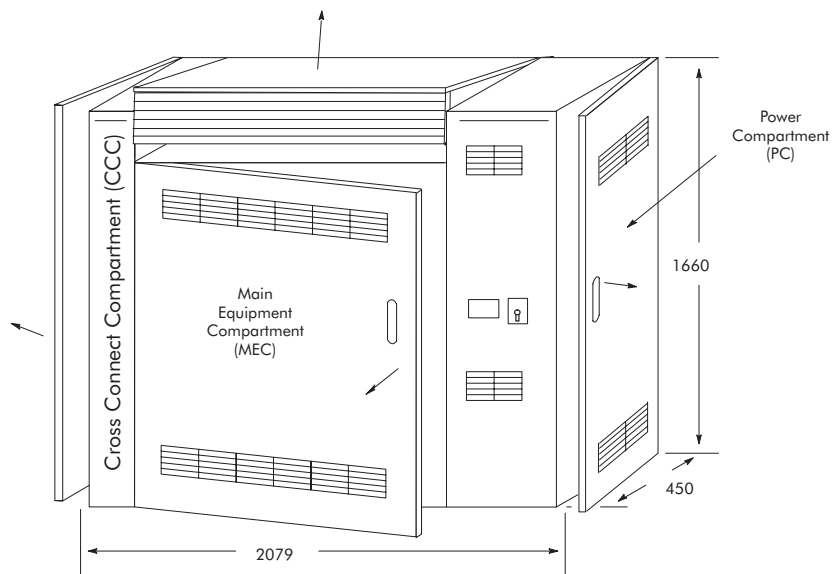


Figure 4-3 480 Line 1G Remote Housing

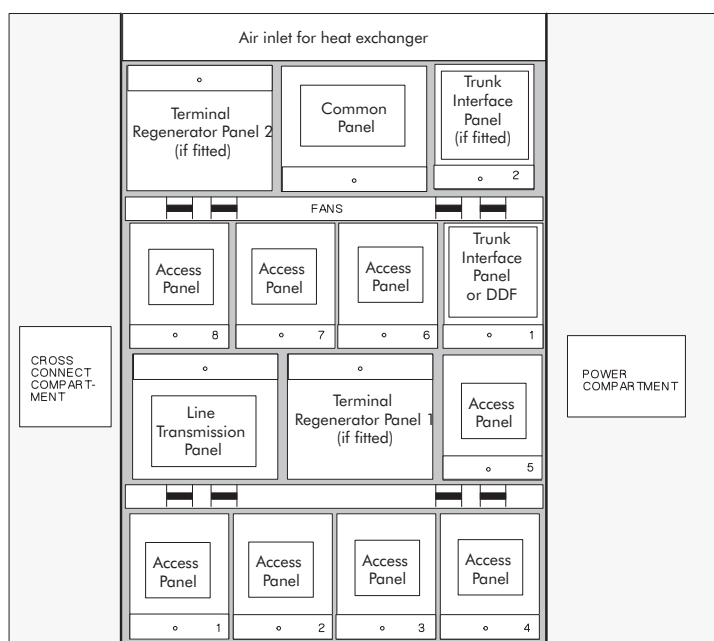


Figure 4-4 Typical RIM 480 Line 1G Housing Layout

4.2.3 RIM Units

(1) Customer Interfaces

Generic Features

Dual Subscriber Line Audio processing Circuit (DSLAC) integrated circuits are used to provide signal processing for two customer lines simultaneously. In combination with the hybrids, the DSLAC performs impedance synthesis to match any line termination from a single source impedance.

The DSLAC uses digital signal processing techniques to implement adaptive hybrid balancing, filtering and gain control for all types of line conditions. It also performs the PCM codec functions and is fully readable for programming verification.

Transmit and receive levels as well as impedance and trans-hybrid balance are software settable on each of the 2-wire units. The default hybrid balance network is set to be the same as the selected line impedance. The adaptive hybrid balance feature is invoked under operator command when commissioning and converges within 10 seconds. The setting is then stored in non-volatile memory and is automatically reloaded upon system power-up.

Lightning surge protection is superior to that specified by ITU-T Rec. K.20. The VF interfaces have a three stage protection system as follows:

- ▶ The primary protection is the installation of fast acting gas-filled protectors on the Cross Connect Frame (CCF), which is located within the CCC.
- ▶ Secondary protection is provided through the use of trisils on the channel units. To ensure the gas-filled protectors can also fire, series impedance is provided between the trisil and the gas-filled protectors. The breakover characteristics of the trisil ensure that a very low voltage appears across the circuit.
- ▶ Tertiary protection varies from unit to unit. The SLIC used on the POTS Remote Unit for example has its own inbuilt protection against voltage surges and transients.

Units Mounted in an Access Panel

The customer interfaces available allow for different configurations for carrying VF, data and ISDN traffic. The units available vary from 4 to 10 channels per unit (4, 5, 6 or 10), depending on their complexity. Any mixture of units is allowed within one Access Panel, including the logical Access Panel in a C-RIM Main Panel.

Each Access Panel supports up to 60 POTS channels or timeslots in 7 card slots. In the remote housing eight Access Panels (or one C-RIM Main panel plus seven Access Panels) can support up to 480 POTS lines.

Each unit allows flexible timeslot assignment so that an interface on a unit can be assigned to any timeslot within the 2048kbit/s link except TS0 or TS16.

The customer interface cards that are currently supported by the RIM which are housed in the Access Panel are described below.

- ▶ POTS EU and RU.
- ▶ Universal EU and RU.
- ▶ 4/6 wire unit.
- ▶ ISDN 4B3T unit.
- ▶ ISDN 2B1Q unit.
- ▶ 64kb/s–G.703 unit.
- ▶ P–Phone.

At the Exchange Unit the Access Panel is required in non-integrated access applications to provide exchange end POTS interfaces. The panel also provides exchange-end access for non-POTS services such as 4-wire, indial PABX lines and ISDN basic access.

POTS Plain Old Telephone Service (POTS) units provide 10 channels per unit and support the following audio frequency services:

- ▶ POTS (up to 1500 ohms loop, not including phone).
- ▶ Modem data services.
- ▶ PABX (Loop–In/Indial) exchange lines.
- ▶ PABX (Ring/Loop) tie lines.
- ▶ PABX outdoor extensions.

Impedance	600 ohms, 1200 ohms, or complex *
Send level	–8 dBr to + 5 dBr
Receive level	+2 dBr to –11 dBr
Loop resistance	0 to 1500 ohms

Table 4–2 POTS RU Interface Specification

Impedance	600 ohms, 1200 ohms, or complex *
Send level	−8 dBr to + 5 dBr
Receive level	+2 dBr to −11 dBr

Table 4–3 POTS EU Interface Specification

* Standard complex impedance is 220 ohms in series with the parallel combination of 820 ohms and 120 nF.

Universal Universal units (UNIV–EU and UNIV–RU) provide 6 channels per unit. They support all the functions of the standard POTS unit, plus:

- ▶ Long line (up to 3400 ohms loop).
- ▶ Credit card payphones.
- ▶ Customer private metering (12 kHz or 50 Hz).
- ▶ Securitel service.

Impedance	600 ohms, 1200 ohms, or complex *
Send level	−8 dBr to + 5 dBr
Receive level	+2 dBr to −11 dBr
Loop resistance	
– Short line mode	0 to 1100 ohms
– Long line mode	1000 to 3600 ohms

Table 4–4 UNIV–RU Interface Specification

Impedance	600 ohms, 1200 ohms, or complex *
Send level	−8 dBr to + 5 dBr
Receive level	+2 dBr to −11 dBr

* Standard complex impedance is 220 ohms in series with the parallel combination of 820 ohms and 120 nF.

Table 4–5 UNIV–EU Interface Specification

4/6 Wire Unit The 4/6 wire unit supports 4–wire Cailho and 6–wire single E&M signalling and has 4 channels per unit. It is common to the Exchange and Remote Units.

Impedance	600 ohms
Send level	–8 dBr to + 5 dBr
Receive level	+2 dBr to –11 dBr

Table 4–6 4/6 Wire Interface Specification

P–Phone P–Phone is the generic name given to the Electronic Business Service (EBS) which is a feature of the Nortel DMS–100 exchange. In addition to VF, P–Phone services digitally transmit display and signalling information between the DMS–100 and P–Phone handsets at the customer’s premises.

P–Phone units at the EU and RU are used to transport P–Phone services via the RIM or C–RIM.

Impedance	900 ohms
Send level	–8 dBr to + 5 dBr
Receive level	+2 dBr to –11 dBr
Max cable length at RU	Loop resistance 0 to 1230 ohms or line loss of 24 dB @ 8kHz (whichever is the shorter cable length).

Table 4–7 P–Phone Wire Interface Specification

Data Interfaces

64kb–E&M

This unit offers 5 data channels, each with a 64 kbit/s co–directional interface with E & M leads. It is common to the EU and RU.

Impedance	120 ohms, nom. balanced
Line code	as per G.703 section 1.2.1
Output level	1 VDC nom. (peak) into 120 ohms
Cable attenuation	up to 3 dB at 128 kHz

Table 4–8 64KB–E&M Interface Specification

ISDN (2B1Q, 4B3T)

There are two units used in the RIM to provide an interface to the ISDN Basic Access Network. They are the 2B1Q and 4B3T units.

Both these units allow the RIM to operate as a basic access repeater to ISDN, thus allowing the ISDN lines to be extended from the parent exchange. In a repeater style configuration, two ISDN units would be required in a back-to-back arrangement as shown below:

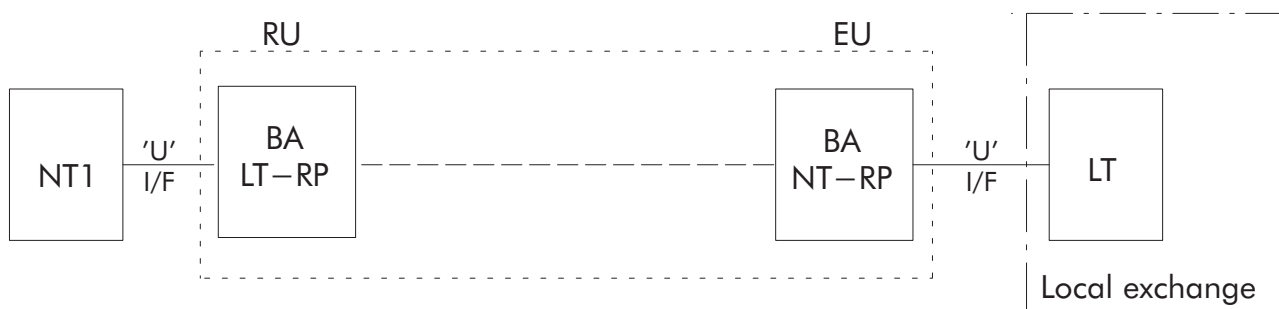


Figure 4–5 ISDN Arrangement

Impedance	135 ohms, nom. balanced
Line code	2B1Q
Output level	2 x 64 kbit/s B and 1 x 16 kbit/s D
Cable attenuation	Up to 4.5 km of 0.4 mm twisted pair
Power feeding	–100 VDC at 45 ± 3 mA

Table 4–9 2B1Q Interface Specification

Impedance	135 ohms, nom. balanced
Line code	4B3T
Output level	2 x 64 kbit/s B and 1 x 16 kbit/s D
Cable attenuation	Up to 3.4 km of 0.4 mm twisted pair
Power feeding	–100 VDC at 45 ± 3 mA

Table 4–10 4B3T Interface Specification

Other

There are other Alcatel interface units available which are pin for pin compatible with the RIM units.

	POTS	Univ	4/6 Wire	ISDN 2B1Q/ 4B3T	64kb/s G.703	P–Phone
POTS	Yes	Yes				
Analogue data (modem line)	Yes	Yes				
PABX	Yes	Yes				
Step by step	Yes	Yes				
Leased line		Yes				
Payphone		Yes				
ROI	Yes	Yes				
ROA	Yes	Yes				
Securitel		Yes				
Unbalanced feed		Yes				
Long line POTS (to 3600 ohms)		Yes				
Customer private metering		Yes				
6 wire E&M			Yes			
4–wire cailho			Yes			
ISDN				Yes		
64 kbit/s data					Yes	
P–Phone						Yes

Table 4–11 Channel Card Function Summary

CTU This unit performs remote customer line testing. It contains the circuitry for applying the correct conditions to the customer's line and making the appropriate measurement.

The "speech path" test circuitry enables call set up between the test operator and customer (ring testing) and contains measuring circuits for tone and decadic dialling test. The howler and busy line monitoring are also implemented by this circuit.

The CTU is installed in an Access Panel to gain access to the ring and test buses, and for power. The CTU receives test commands from the NMQ and returns the test results to the operator via the NMQ.

ECTU The ECTU unit will be introduced to the traditional RIM architecture in Release 6.1, and to C–RIM architecture with Release 8.2.

- ▶ In Release 6.1, the ECTU offers the same range of tests as the CTU.
- ▶ In Release 8.2 the ECTU offers the same range of tests as the CTU, plus the following additional tests:
 - Support for testing of long lines which require a 100 volt feed.
 - Remote software download.
 - Advanced battery management facilities.

(2) Transmission Units – RIM

The Line Transmission Panel is capable of supporting higher order multiplex equipment and/or optical systems in the following configurations:

- ▶ 8 Mbit/s Optomux unit (Dual fibre) (up to 40 km run *).
 - ▶ 8 Mbit/s Optomux unit (Single fibre) (up to 25 km run *).
 - ▶ 8 Mbit/s Optical system (Dual Fibre) (up to 50 km run *).
 - ▶ 34 Mbit/s Optical system (Dual fibre) (up to 50 km run *).
 - ▶ 34 Mbit/s Optical system (Single fibre) (up to 25 km run *).
- * These distances are approximate only and will vary depending on optical fibre cable quality.

Note The 8 Mbit/s Optical unit is used in conjunction with a 2DME unit.

The 34 Mbit/s Optical unit is used in conjunction with a 2/34 Mbit/s Mux (Skipmux).

The following units may be installed in the Line Transmission Panel:

- ▶ 2/34 Mbit/s Mux.
- ▶ Optomux.
- ▶ 2DME Unit.
- ▶ 8Mbit/s & 34Mbit/s Optical.

- ▶ 34Mbit/s Electrical Unit.
- ▶ Auxiliary Services Unit (ASU).
- ▶ Line Transmission Controller.
- ▶ Climate Controller / Climate I/O (CLIMI/O).
- ▶ Terminal Regenerator Unit (TRU) – power feed and non–power feed.

2/34 MUX The 2/34 Mux takes sixteen, 2Mbit/s streams and multiplexes them into a single 34Mbit/s stream. This unit is housed in the Line Transmission Panel at the extreme left side. The mechanics of this slot has been designed to accommodate the T9 unit size.

The sixteen 2Mbit/s ports are accessed via Burndy connectors on the Line Transmission Panel back plane. The 34 Mbit/s trunk is connected to a 34 Mbit/s Optical unit. Redundant switching to a second 34 Mbit/s Optical unit is provided by the ASU if required.

Optomux The Optomux unit provides 2 to 8 Mbit/s higher order multiplexing and an 8 Mbit/s optical transmission interface on a single unit. It provides input/output access for up to four 2 Mbit/s tributaries and input/output access to an optical signal derived from four tributaries.

Line Rate	16.896Mbit/s
Optical wavelength	1310 nm
Connectors	2 x DIN
Optical output	–11 dBm $\pm$ 1 dB
Optical input	–10 to –30 dBm for BER = 1E–10

Table 4–12 8 Mbit/s Dual–Fibre Optomux Interface Specification

Single fibre Optomux and OLTE have an angled SC optical connector and provide 6.5 dB less dynamic range.

2DME The 2DME unit multiplexes up to four 2048 kbit/s tributaries into one 8448 kbit/s bearer and is normally used with 8Mbit/s optical cards.

8 and 34 Mbit/s Optical Units

There are three optical transmission units that may be used in the Line Transmission Panel in an unduplicated or 1+1 redundancy arrangement:

- ▶ 8 Mbit/s Optical dual fibre.
- ▶ 34 Mbit/s Optical dual fibre.
- ▶ 34 Mbit/s Optical single fibre.

Each of these units, or redundant pairs of units, is used in conjunction with a multiplexer; a 2DME for an 8 Mbit/s system and a 2/34 Mux for a 34 Mbit/s system. In addition, an Auxiliary Services Unit (ASU) is used for signal switching, supervision and control of the optional 1+1 redundancy facility, and transmission of OA&M via the optical service channel.

Note

Single fibre and dual fibre systems are available for the 34 Mbit/s units.

Line rate	16.896Mbit/s
Wavelength	1310 nm
Connectors	2 x DIN
Optical output	-11 dBm $\pm$ 1 dB
Optical input	-10 to -42* dBm for BER = 1E-10 (*includes margin for aging, temperature, etc.)

1+1 Protection Switching option available

Table 4-13 8 Mbit/s LCFO I/F Specification

Line rate	68.736 Mbit/s
Wavelength	1310 nm
Connectors	2 x DIN
Optical output	-11 dBm $\pm$ 1 dB
Optical input	-10 to -35* dBm for BER = 1E-10 (*includes margin for aging, temperature, etc.)

1+1 Protection Switching option available

Table 4-14 34 Mbit/s LCFO I/F Specification

Line rate	68.736 Mbit/s
Wavelength	1310 nm, single mode, single fibre both ways transmission
Connectors	SC/APC
Optical output	– 14 dBm $\pm$ 1 dB
Optical input	– 10 to – 30 dBm for BER = 1E–10 (*includes margin for aging, temperature, etc.)

1 + 1 Protection Switching option available

Table 4–15 34 Mbit/s Single fibre LCFO I/F Specification

34 Mbit/s Electrical

The 34Mbit/s Electrical unit is designed to be installed in place of the 34Mbit/s Optical unit. It has two 1.6/5.6 connectors providing an interface capable of connection to the G.703 interface of an external DME and/or line equipment, with up to 10 dB loss in the connection.

Line rate	34.368 Mbit/s $\pm$ 20 ppm
Impedance	75 ohms unbalanced
Line code	HDB3
Output level	1V nom (peak)
Permissible cable loss	10dB at 17.184MHz

Table 4–16 34 Mbit/s Electrical Interface Specification

(3) Core and System Management Units – RIM

The Common Panel provides control, clock generation/distribution and OA&M access functions at both the Exchange and the Remote Units. The remote Common Panel also provides timeslot interchange and the concentration controller system.

The units used in the Common Panel are:

- ▶ ECC.
- ▶ PCMCX–CC.
- ▶ COX.
- ▶ COP.
- ▶ SCK.
- ▶ RMU.
- ▶ ERMU.
- ▶ NMQ.

- ECC/PCMCX—CC** The ECC (Enhanced Concentration Controller) provides integrated access to a System 12 exchange via the RSU protocol. The PCMCX—CC provides integrated access to an AXE exchange via ARK—P protocols. These units are mutually exclusive.
- COX** The timeslot interchanger (COX) provides non—blocking, programmable cross connection of 64 kbit/s timeslots.
- COP** The COP is the main core processor card for the RIM and must be installed at both the EU and RU.
- SCK** The System Clock Unit (SCK) provides clock generation and distribution functions. All the clock and frame signals required for system synchronisation are generated and distributed to the user units.
- RMU** The RIM Management Unit is responsible for providing an integrated OA&M system. The RMU communicates with the EU and RU Network Management units (NMQ) using the Q2 protocol via an embedded operations channel.
- ERMU** The Enhanced RIM Management Unit is responsible for providing an integrated OA&M system. The ERMU communicates with the EU and RU Network Management units (NMQ) using the Q2 protocol via an embedded operations channel. It has similar functionality to the RMU with additional features including an X.25 interface for connection to the DCN without a Mediation Device.
- NMQ** The NMQ supports all the local operator, administration and maintenance functions required at the site it is located. There is one located at the EU and one at the RU site in the Common Panels.

4.3 Compact RIM (C–RIM) Architecture

This section covers the traditional architecture referred to as RIM. For details of the C–RIM compact architecture, refer to Section 4.2.

4.3.1 C–RIM Panel Overview

In C–RIM, transmission, system control and customer interface functions are implemented across a number of panels located at the EU and RU as described below.

Access Panel

- ▶ Access Panels are used in both C–RIM and the traditional RIM architecture. In C–RIM Access Panels are required at the RU for a C–RIM with more than 60 channels, and are also required at the EU for non–integrated services that are not carried by the Main Panel.

Ring/Meter Panel

- ▶ This panel generates ring supply, 50 Hz & 12 kHz signals, –100V DC battery for ISDN and Long Lines at the RU.

The Ring/Meter Panel is used in both C–RIM and traditional RIM. In C–RIM it is only required in indoor RU with more than 180 lines. Ring/Meter Units are housed in the Main Panel in systems with 180 lines or less.

Main Panel (C–RIM only)

- ▶ The Main Panel has multiple functions which encompass those of the Common Panel, Line Transmission Panel, Trunk Interface Panel and the first Access Panel in traditional RIM. In RU with less than 180 lines, a RiMU is fitted to the Main Panel and a Ring/Meter Panel is not required.

It houses line transmission units, management and control units, and channel units for the first 60 customer lines.

Climate Control Panel

- ▶ This panel is used only for C–RIM RU mounted in the 480 Line 1G Remote Housing.

EU panels are located at the exchange and are mounted in racks, while RU panels are either mounted in racks in an internal remote building or mounted in a RIM housing.

Panel usage is described in the table on the next page.

Function	Panel Type	C-RIM EU	C-RIM RU
Transmission	Main	Yes	Yes
System control	Main	Yes	Yes
Customer interface	Access	[1]	[2]
	Ring/Meter		[3]
	Main	Yes	Yes

[1] Required at EU for more than 60 non-integrated lines

[2] Required at RU in systems with more than 60 lines

[3] Required at RU for systems with more than 180 lines

Table 4–17 Panel Types and Functions – C-RIM

4.3.2 C–RIM Panel Layouts

(1) Exchange Unit Layout

The C–RIM EU provides the interfacing function between the C–RIM RU and the parent exchange. It is installed in Type 84 and 92 racks and located indoors at the exchange site.

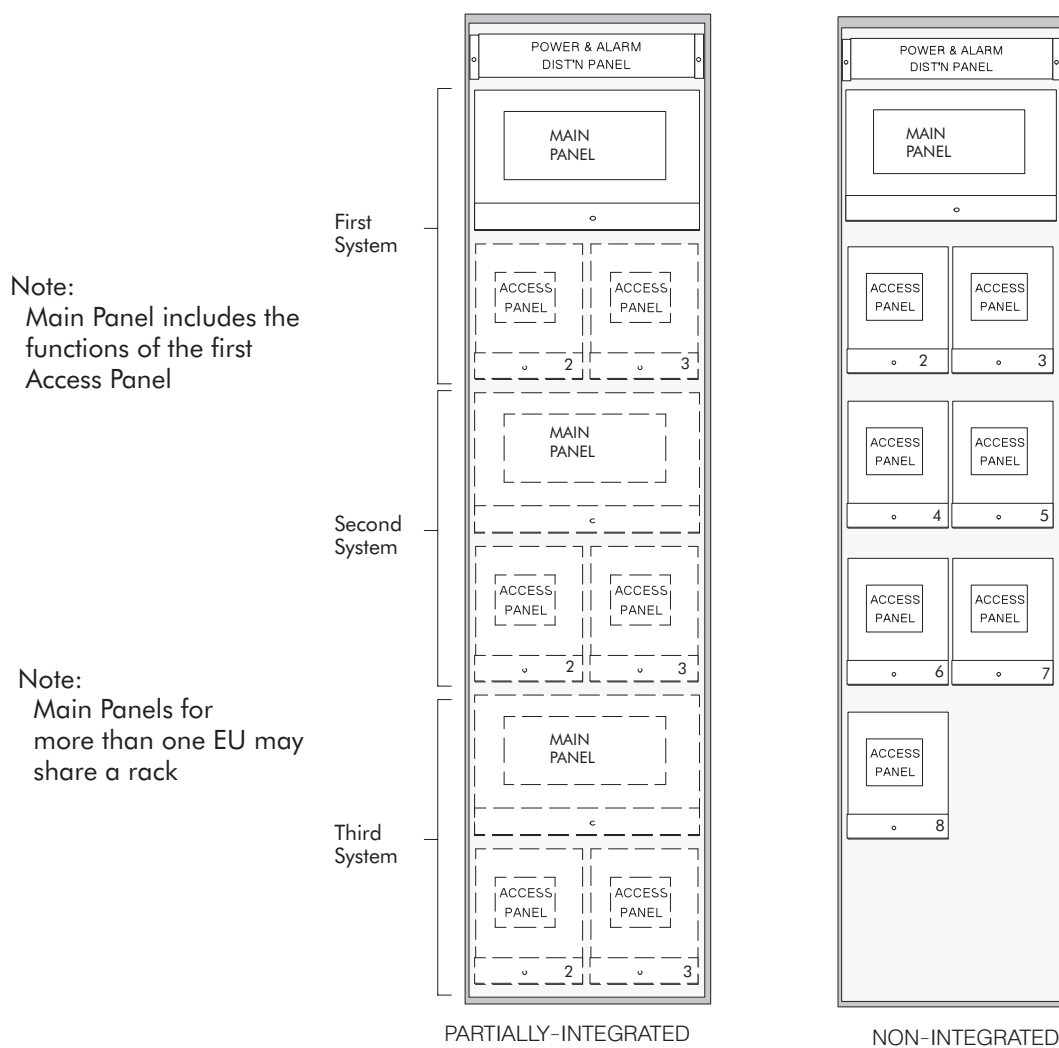


Figure 4–6 Typical C–RIM EU Rack Layouts

(2) Indoor Remote Unit Layout

The diagram below shows some typical panel layouts for remote indoor systems. Panel layouts vary according to their application.

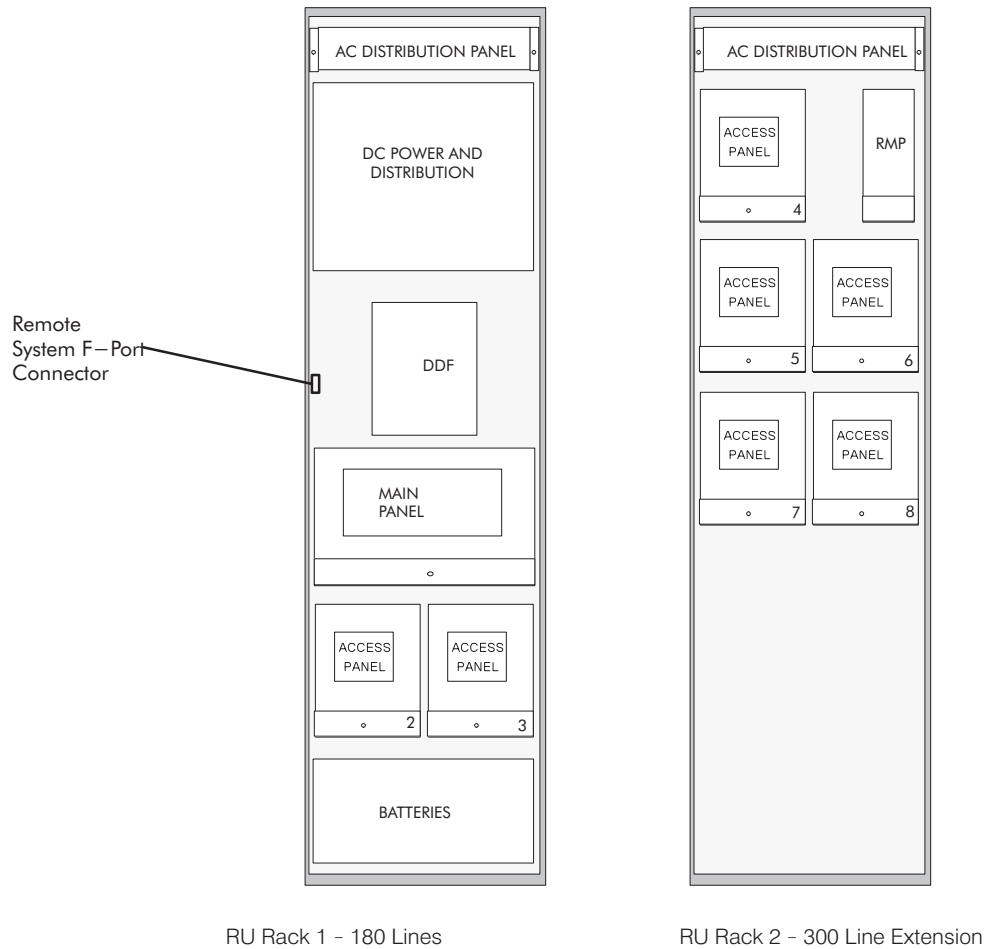


Figure 4-7 Typical C-RIM RU Indoor Panel Layouts

(3) 480 Line 1G Remote Unit Housing Layout

The 480 Line 1G Remote Housing is used for C–RIM as well as RIM. In this application it houses the Main Panel and up to seven Access Panels providing the maximum 480 POTS lines capacity.

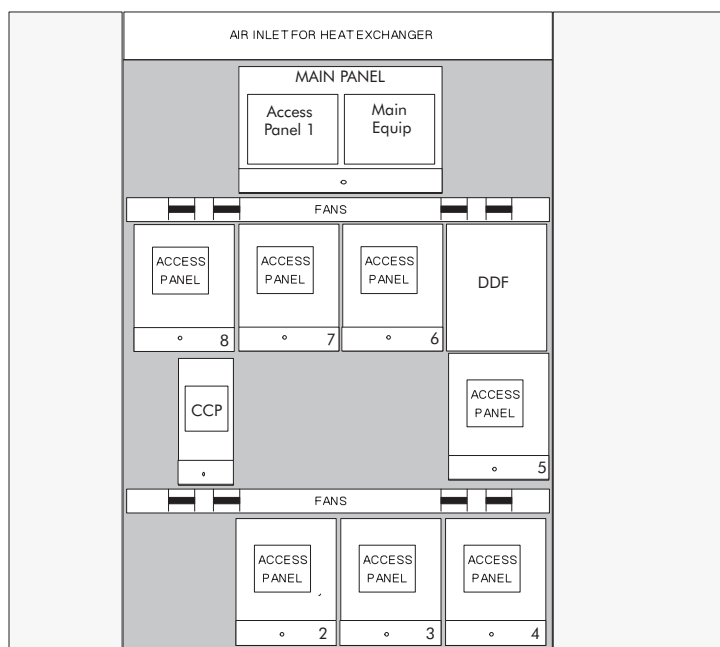


Figure 4–8 Typical C–RIM 480 Line 1G RU Housing Layout

(4) 180 Line Remote Unit Housing Layout

The 180 Line Remote Housing is used only for C–RIM. For services, it can house the logical Access Panel in the Main Panel plus two Access Panels providing the maximum 180 POTS lines capacity.

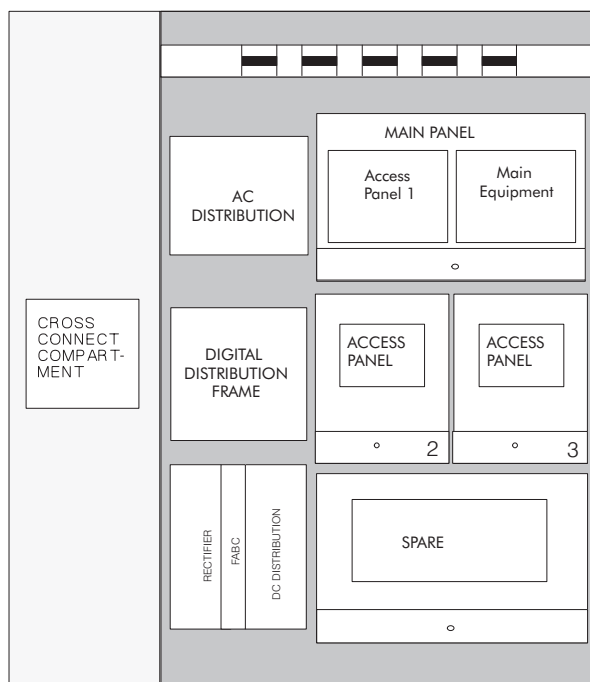


Figure 4–9 C–RIM 180 Line RU Housing layout

(5) 480 Line 2G Remote Unit Housing Layout

The 480 Line 2G Remote Housing is used only for C-RIM. For services, it can house the logical Access Panel in the Main Panel plus seven Access Panels providing up to 480 POTS lines.

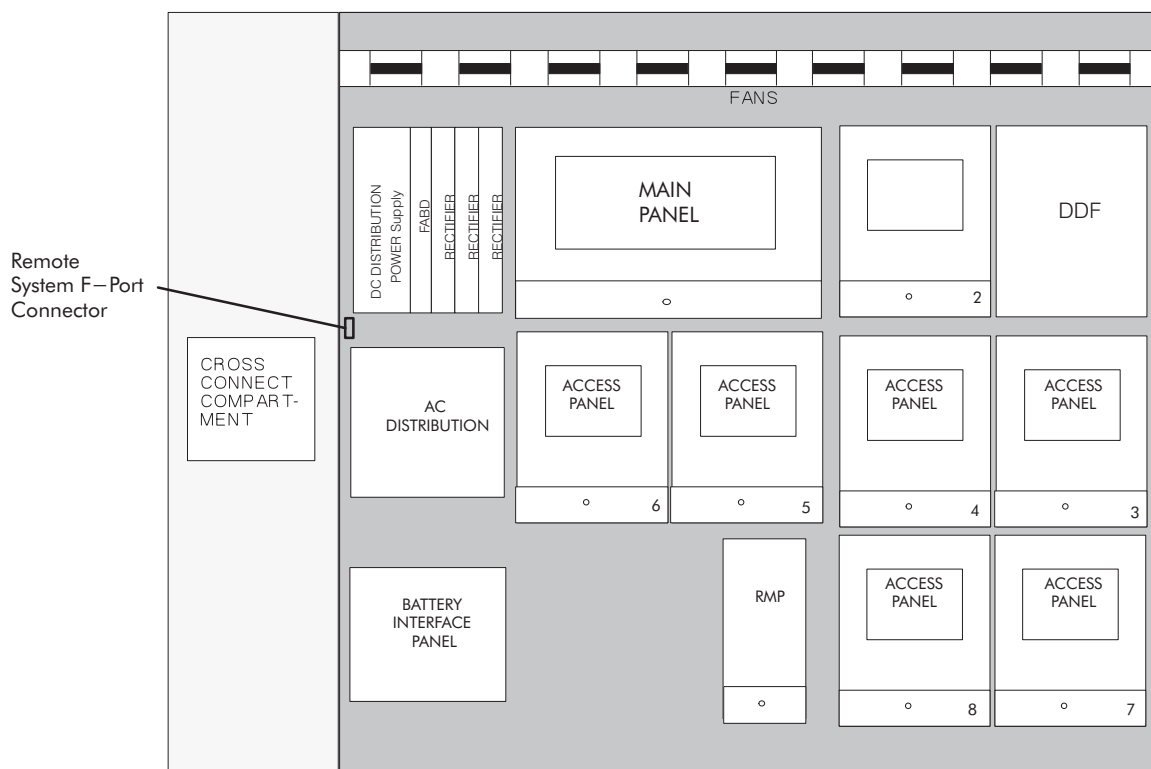


Figure 4–10 C-RIM 480 Line 2G RU Housing layout

4.3.3 C–RIM Units

Many RIM units are also used in C–RIM. Some RIM units are not required by C–RIM. C–RIM also introduces some new units which in some cases combine the functionality of more than one RIM unit.

(1) Customer Interfaces

The customer interfaces used by C–RIM are the same as those used by RIM. In C–RIM they are housed in the Main Panel and Access Panels. For details of customer interfaces see page 4–9.

(2) Line Transmission Units

The C–RIM line transmission units are:

- ▶ 2Mbit/s Optical Unit (2M OLTE).
- ▶ 4 x 2Mbit/s Optomux (OMX 4x2M).
- ▶ 16 x 2Mbit/s Optomux (OMX 16x2M).

2M OLTE The 2M OLTE unit for the C–RIM provides a single 2Mb/s G.703 interface to a single optical interface. It is designed to work without repeaters. It has a power budget of 11dB and is suitable for optical bearer systems over distances of up to 25 km.

OMX 4x2M The OMX 4x2M unit for the C–RIM provides 4 x 2Mb/s G.703 interfaces to be multiplexed onto a single optical interface. It is designed to work without repeaters. It has a power budget of 11dB and is suitable for optical bearer systems over distances of up to 25 km.

OMX 4x2 – Optical Interface Specifications

Frequency	16.896 Mbit/s +/- 20 ppm
Line coding	3B6B (Proprietary)
Wavelength	1310 nm (single mode)
Optical output	-14 dBm +/- 1dB
Optical input	-10 to -26.5* dBm for BER = 1E-10
Connector	Angled SC (SC-APC)

* includes margin for ageing, temperature, component, tolerances etc.

Table 4–18 Optical Interface – OMX 4x2

OMX 16x2M The OMX 16x2M unit for the C–RIM provides 16 x 2Mb/s G.703 interfaces to be multiplexed onto a single optical interface. It is designed to work without repeaters. It has a power budget of 11 dB and is suitable for optical bearer systems over distances of up to 25 km.

OMX 16x2M – Optical Interface Specifications	
Frequency	68.736 Mbit/s +/– 50 ppm
Line coding	3B6B (Proprietary)
Wavelength	1310 nm (Single mode)
Optical output	–14 dBm +/– 1dB
Optical input	–10 to –26.5* dBm for BER = 1E–10
Connector	Angled SC (SC–APC)

* includes margin for ageing, temperature, component, tolerances etc.

Table 4–19 Optical Interface – OMX 16x2M

(3) Core and System Management Units – C–RIM

In addition to the power, line transmission and channel units, the management and control units equipped in the Main Panel include:

- ▶ PCM controller card and management unit (PCMCC).
- ▶ PCM Controller eXtended (PCMCX).
- ▶ Enhanced Concentration Controller (ECC).
- ▶ V5.2(–) Concentration Controller (ICC).
- ▶ Core MatriX, timeslot interchanger (CMX).
- ▶ Clock eXtraction and Distribution Unit (CXDU).
- ▶ 180 line Ring/Meter Unit (RiMU).

ECC The ECC is a unit is supported by C–RIM Release 8.0 or later to provide integrated/concentrating access to a S12 exchange via the RSU/S12 protocol.

ICC The ICC is a unit which is supported by C–RIM Release 8.0 and later to provide integrated access to an exchange via the V5.2(–) protocol.

CMX The timeslot interchanger (CMX) provides non-blocking, programmable cross connection of 64 kbit/s timeslots. The CMX was introduced with Release 8.0.

PCMCC The PCMCC (Pulse Code Modulation Controller) is the heart of the C-RIM providing OA&M facilities and conversion to and from the 2x2Mbit/s bus, the 4Mbit/s bus and the 2Mbit/s G.703 bus.

PCMCX The PCMCX (Pulse Code Modulation Controller Extended) provides conversion to and from the 2x2Mbit/s bus, the 4Mbit/s bus and the 2Mbit/s G.703 bus.

The PCMCX manages the second block of 30 channels in the Main Panel, and each block of 30 channels in Access Panels, by providing the PCM channel interface between the channel cards and the line transmission unit.

CXDU The CXDU (Clock Extraction and Distribution Unit) is used to provide clock extraction and distribution for the Access Panels and for other units in the Main Panel. It is also required in an EU without Access Panels if the C-RIM is synchronised from a bearer.

ERMU The ERMU (Enhanced RIM Management Unit) is responsible for providing an integrated OA&M system. The ERMU communicates with the EU and RU network management units (PCMCC) using the Q2 protocol via an embedded operations channel.

RiMU The Main Panel accommodates a T9 Ring/Meter Unit (RiMU) in installations with 180 lines or less. Installations with more than 180 lines use the T8 Ring/Meter Unit.

T8 Ring/Meter Unit In RU with more than 180 lines T8 Ring/Meter Units are required. These are located:

- ▶ In a Ring Meter Panel in indoor RU or a 480 Line 2G Remote Housing.
- ▶ In the Power Compartment of 480 Line 1G Remote Housings.

4.4 RIM and C–RIM Releases – Feature Summary

Each release either adds new features to its predecessor or modifies existing ones.

4.4.1 RIM Release 1

Produced from January 1993 to September 1994. Phased out of Telstra network in 1997.

RIM Release 1 used traditional RIM architecture.

The initial release of RIM supported:

- ▶ POTS (Telephony, Analogue (VF and Data), Special Services).
- ▶ DDS (Digital Data Services).
- ▶ AUSTPAC.

4.4.2 RIM Release 2

Produced from January 1994 to September 1994. Phased out of Telstra network in 1997.

RIM Release 2 used the traditional RIM architecture. The following features were offered in addition to those in Release 1.

- ▶ It provided integrated access to an AXE parent exchange using the ARK–P protocol with concentration. This required two additional units in the RU Common Panel:
 - PCMCX–Concentration Controller (CC).
 - MFC/Progress Tone Unit (MFC/PT).
- ▶ There were also two new modes of operation of the PCMCX in the EU Common Panel to allow provision of the OA&M channel. They are:
 - DIL (Drop–Insert Line).
 - DIE (Drop–Insert Exchange).
- ▶ The PCMCX–CC is a standard PCMCX unit with special software for co–ordinating integrated access calls, while the MFC/PT provides MFC transceivers for signalling as well as progress tone generators.
- ▶ Integrated Access only supported switched services connected via a POTS Remote Unit or enhanced switched services via a UNIV Remote Unit. Customer private metering was supported on Universal Channel Units, but payphones were not supported.

4.4.3 RIM Release 3

Produced from September 1994 to November 1995.

RIM Release 3 uses traditional RIM architecture. The following features are offered in addition to those in Releases 1 and 2.

- ▶ ISDN basic rate access support with the following units:
 - 2B1Q.
 - 4B3T.

- ▶ Remote software download for the RMU.

Previous releases of RIM required a SWD (Software Download) link to be set on the front of the RMU in order for software download to be executed. In RIM Release 3, this link is no longer required, allowing SWD for Release 3 onwards to be done remotely.

- ▶ Provision for OA&M over optical service channel.

Release 3 provides the facility to transport OA&M information in the optical service channel. This may be used if a LTP is installed and external line transmission is not employed. Use of the optical service channel does not require any timeslots to be allocated to OA&M and eliminates the need for RAC, DIL/DIE and Q2BA units. This option applies to the following configurations:

- 34Mbit/s Optical configuration.
- 8Mbit/s Optical configuration.
- Optomux configuration.
- ▶ Additional enhancements include:
 - Filtering of Dummy FNNs in the Services Affected screen.
 - 5 security levels.
 - Indoor Ring/Meter Panel alarm collection through 4 NMQ external inputs.
- ▶ A Digital Distribution Frame (DDF) may be installed at the RU in place of a Trunk Interface Panel (TIP).

4.4.4 RIM Release 3.1

This is a current release. It has been in production since January 1995.

RIM Release 3.1 uses the traditional RIM architecture. The following features are offered in addition to those in Releases 1, 2 and 3.

- ▶ ESM protocol support.
- ▶ Enhanced ARK–P protocol for integration with AXE Exchanges. Additional features provided by these protocol enhancements include Subscriber signalling options for:
 - Reversal on answer.
 - Reversal on idle.
 - Unbalanced feed.
 - Payphones.
- ▶ PBX group facility supporting up to 20 PBX hunt groups each with up to 40 members.
- ▶ Support for Analogue transmission such as FDM or LoopMuxes. – A Modem panel has been added and the Q2BA unit has been enhanced to include 4wire–2wire conversion facilities.
- ▶ Enhancements to the Climate I/O Unit to provide an optional lower fan voltage.
- ▶ Additional Units.
 - Single Fibre 34Mbit/s Optical.
 - 34Mbit/s Electrical Interface.

4.4.5 RIM Release 4

This release was in production from February 1995 to October 1997. It has been superseded by Release 8.0 on the C–RIM platform.

RIM Release 4 uses the traditional RIM architecture.

Release 4 modifies previous functionality to provide integrated access to a System 12 parent exchange using the RSU protocol with concentration. This requires a new unit in place of the PCMCX–CC in the RU Common Panel:

- ▶ Enhanced Concentration Controller (ECC).
The ECC is a specialised hardware and software solution for terminating the RSU protocol with the S12.
- ▶ Integrated access will only support switched services connected via a POTS Remote Unit or enhanced switched services via a UNIV Remote Unit. Customer private metering and payphones are supported on UNIV units.
- ▶ The initial interworking with System 12 was with the SAS2 release. As SAS2 does not support blocking of individual channels, in a fully integrated system, OA&M information had to be transported via the Optical Service Channel.
SAS3, available since 1995, allows blocking of individual channels and therefore allows transportation of OA&M via the first two timeslots using the RAC.

4.4.6 RIM Release 5

Not released to production. The Release 5 features were incorporated into Release 3.1.

4.4.7 RIM Release 6.1

Not yet in production. To be released in 1998.

RIM Release 6.1 uses traditional RIM architecture. The following features are offered in addition to those in Releases 3.1 and 4.

- ▶ Support with a single software release for the following:
 - Non—integrated.
 - Integrated.
 - ESM protocol.
 - Integrated and Concentrated.
RSU protocol with concentration for integrated access to a System 12 parent exchange.
- ▶ Enhanced RMU (ERMU) for COMNET—2 support, with X.25 interface, Local Port Access, and Alarm History.
- ▶ P—Phone support.
- ▶ New housing features.
 - Revised climate controller.
 - Support for dual voltage Climate I/O unit.
- ▶ New OA&M features:
 - Equalisation of customer lines.
 - Automatic Hybrid Balancing.
 - Remote Inventory.
 - Additional customer line tests.
 - "Inwards" dial tone test.
 - FTARS test.
 - Advanced battery management.
 - Alarm filtering.
 - Special Services testing.
- ▶ Improved Distinctive Ring timing.
- ▶ Advanced Battery Management

4.4.8 C–RIM Release 7.1

A current release, produced since August 1996.

C–RIM Release 7.1 uses the Compact RIM architecture. Some existing RIM equipment is used along with some newly developed hardware units and software to provide a delivery platform for up to 480 lines.

- ▶ New panels for C–RIM are the Main Panel and the Climate Control Panel. Common to both C–RIM and RIM are the Access Panel and Ring/Meter Panel.
- ▶ New Units are the PCMCC, CXDU, RiMU, OLTE, 4x2M OMX, and 16x2M OMX. Common to both C–RIM and RIM are ERMU, PCMCX, Channel Units, PWRA, and Ring/Meter.

The customer services are fully equivalent to corresponding customer services provided by previous RIM releases.

- ▶ Protocols supported are non–integrated and ESM/RIM. Concentration and grooming are not supported by Release 7.1.
- ▶ Release 7.1 supports the ERMU developed as part of COMNET–2.
- ▶ The OA&M channel is multiplexed onto the NUB of the first 2Mbit/s bearer, which must be non–integrated at both the EU and RU in Release 7.1.

4.4.9 C–RIM Release 8.0

A current Release, in production since September 1997.

C–RIM Release 8.0 uses the Compact RIM architecture, and is based on the hardware and software of Release 7.1.

- ▶ Release 8.0 supports the non–integrated and ESM access with the same range of integrated and non–integrated services as Release 7.1.
- ▶ Additional integrated access modes support concentration via RSU and V5.2(–) protocols. Additional units required for concentration are:
 - ECC concentration controller for RSU protocol.
 - ICC concentration controller for V5.2(–) protocol.
 - CMX Core Matrix to perform dynamic cross–connection of bearer timeslots and customer lines for RSU and V5.2(–) protocols.
- ▶ P–Phone support.
- ▶ New OA&M features:
 - Equalisation of customer lines.
 - New customer line tests:
 - “Inwards” dial tone test.
 - FTARS test.
 - Remote inventory.
 - Improved CTU foreign battery test.
- ▶ Support for dual voltage Climate I/O unit.
- ▶ Battery tests for 180 line 2G remote housings.
- ▶ ECC rejection of S12 firmware download.
- ▶ Improved NECTAS configuration software.
User Port addresses for V5.2(–) are assigned to customer lines by the NECTAS Common Configuration application rather than the FNN administration application.
- ▶ FABD fan and battery controller for the 240 line 2G and 480 Line 2G Remote Housings.
- ▶ ECC rejection of S12 software download.

4.4.10 C–RIM Release 8.2

Not yet in production. To be released in 1998.

C–RIM Release 8.2 uses the Compact RIM architecture, and is based on the hardware and software of Release 8.0.

The new features are:

- ▶ Traffic measurement for V5.2(–) interfaces.
- ▶ Support of the LAPV5–DL Link Control Protocol.
- ▶ Additional ISDN functionality:
 - Integrated ISDN services on V5.2(–) interfaces.
 - Service Assurance Functions for 2B1Q ISDN Basic Access interfaces including performance monitoring, fault supervision, and maintenance functions.
- ▶ Special Services testing.
 - Copper pair test functions for POTS and UNIV Channel Units are extended to include tests for 4/6 Wire, ISDN 4B3T, ISDN 2B1Q and P–Phone Channel Units.
 - Support for the DDN NTU:
 - Monitoring of the 2B1Q interface between the RU and and NTU
 - Reporting line status of the interface between the RU and an NTU.
- ▶ Customer Line Tests.
Release 8.2 supports the CTU, and the same range of tests with this unit as in Release 8.0. Release 8.2 also supports the ECTU. Tests supported include the following in addition to those supported by the CTU:
 - Remote software download.
 - Surge Arrestor Testing
- ▶ Automatic hybrid balance.
- ▶ Additional ERMU features.
 - Alarm history holding the latest 500 alarm events.
 - Remote reset of ERMU via a message to the X.25 port.
- ▶ Alarm filtering to reduce the number of fleeting alarms reported by C–RIM.
- ▶ Improved Distinctive Ring timing.
- ▶ Advanced Battery Management

