Technical Handbook

Alcatel 1642 Edge Multiplexer Compact

STM 1 Multi-Service Edge Multiplexer for Customer Premises

1642EMC Rel.1.2
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<td>Add new feature in R1.2A2, mapping of FE to 1xVC4 for ES1 card</td>
<td>Shen Yonghong, Wu Chu, Lennart Priester</td>
<td>Liu Yaqin</td>
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<td>03</td>
<td>2007-04-05</td>
<td>Remove the anti-dust description</td>
<td>Wu Jie</td>
<td>Liu Yaqin</td>
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| 02 | 2007-02-01 | 1. Add China RoHS label and new feature for support −60V power supply.  
2. Update the description for anti-dust and housekeeping connection. | Wu Jie                            | 1642EMC Hardware Team Zhu Hong Liu Yaqin |
| 01 | 2005-07-20 |                                                    | Chang HaiYan, Wu Jie Lennart Priester | 1642EMC Hardware Team Zhu Hong          |

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1642 EDGE MULTIPLEXER COMPACT TECHNICAL HANDBOOK

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1 HANDBOOK STRUCTURE AND CONFIGURATION CHECK

1.1 General information

**WARNING**

ALCATEL makes no warranty of any kind with regards to this manual, and specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. ALCATEL will not be liable for errors contained herein or for damages, whether direct, indirect, consequential, incidental, or special, in connection with the furnishing, performance, or use of this material.

**NOTICE**

The product specification and/or performance levels contained in this document are for information purposes only and are subject to change without notice. They do not represent any obligation on the part of ALCATEL.

**COPYRIGHT NOTIFICATION**

The technical information of this manual is the property of ALCATEL and must not be copied, reproduced or disclosed to a third party without written consent.

1.2 Handbook applicability

This handbook applies to the following product–releases:

<table>
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<th>PRODUCT</th>
<th>ANV P/N</th>
<th>FACTORY P/N</th>
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<td>1642EMC</td>
<td>3AL 97478 AAAA</td>
<td>--.--.--</td>
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<tr>
<td>PRODUCT</td>
<td>RELEASE</td>
<td>VERSION</td>
</tr>
<tr>
<td>1642EMC</td>
<td>1.2</td>
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</table>
1.3 Product–release handbooks

⚠️ The list of handbooks given here below is valid on the issue date of this Handbook and can be changed without any obligation for ALCATEL to update it in this Handbook.

⚠️ Some of the handbooks listed here below may not be available on the issue date of this Handbook.

The standard Customer Documentation in the English language for the equipment whose product–release–version is stated in para.1.2 consists of the following handbooks:

<table>
<thead>
<tr>
<th>Table 1. Handbooks related to the specific product hardware</th>
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<th>Table 2. Handbooks related to the METRO OMSN specific product SW management and local product control</th>
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<tr>
<td><strong>REF</strong></td>
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### Table 3. Handbooks related to ISA ES specific product SW

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<th>REF</th>
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<tr>
<td>[5]</td>
<td>ES1 Rel.1.0 Operator's Handbook</td>
<td>3AL 89872 AAAA</td>
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Provides ISA-ES Craft Terminal screens and operational procedures.

### Table 4. Handbooks common to Alcatel Network Elements using 1320CT platform

<table>
<thead>
<tr>
<th>REF</th>
<th>HANDBOOK</th>
<th>ANV Part No.</th>
<th>FACTORY Part No.</th>
<th>THIS HDBK</th>
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Provides general information and operational procedures common to all 1320CT (Craft terminal) of Alcatel InfoModel Network Elements.

<table>
<thead>
<tr>
<th>REF</th>
<th>HANDBOOK</th>
<th>ANV Part No.</th>
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<tr>
<td>[8]</td>
<td>1330AS 5.1 Operator's Handbook CT+NM EN</td>
<td>3AL 71109 AAAA</td>
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</table>

Provides detailed information and operational procedures regarding the alarm Surveillance software embedded in the 1320CT software package. Information about Historical Alarms an Network Element Symbols Management (Physical Network Management) are not valid for Craft Terminal. They are only used by Network Management.

<table>
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<tr>
<th>REF</th>
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<td>[9]</td>
<td>ELM 5.0 Operator's Handbook CT+NM EN</td>
<td>3AL 71081 AAAA</td>
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Provides detailed information and operational procedures regarding the Event Log Browser software embedded in the 1320CT software package.

### Table 5. Optional handbooks common to 16xxSM

<table>
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<th>REF</th>
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<th>FACTORY Part No.</th>
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Provides general installation rules necessary to install the Optinex family equipment in the S9 Rack.

<table>
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<th>REF</th>
<th>HANDBOOK</th>
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Provides general installation rules necessary to install the Optinex family equipment in the Optinex Rack.

**N.B.** Handbooks REF. [21] and [22] are available only on paper support.
Table 6. Documentation on CD-ROM

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<td>ES1 1.0 CD-ROM-DOC EN</td>
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1.4 Handbook Structure

This handbook has been edited according to the Alcatel standardized “drawing-up guides” complying with such suggestion.

This handbook is divided into the following main topics as described in the table of contents:

**HANDBOOK GUIDE:** It contains general information on safety norms, EMC and type of labels that might be affixed to the equipment. Furthermore, it describes the handbook structure and the customer documentation. The abbreviation list is supplied too.

**DESCRIPTION:** It contains all the equipment’s general and detailed system features including its application in the telecommunication network. Furthermore, it supplies the equipment description and specifications (i.e., system, mechanical, electrical and/or optical).

**MAINTENANCE:** It contains all the details for periodic checks, fault location and repair procedures and restore to normal operation through the withdrawal of faulty units and their replacement with spares (*).

**DISMANTLING & RECYLING:** It contains information for subrack/units dismantling and recycling, list of hazardous materials and waste code.

**APPENDICES:** Section envisaged (but not necessarily included) to describe possible alternative unit.

**HARDWARE SETTING DOCUMENTATION:** It encloses the documents related to unit hardware setting operations, if envisaged.

**ANNEXES:** Section envisaged (but not necessarily included) containing additional documentation or general information on other topics not inherent to the chapters making up the handbook.

(*) If the equipment is software integrated and man-machine interfaced (through a PCD, PC, Work Station or other external processing/displaying system) the maintenance carried out with such system is described in the Operator’s Handbook (see para.1.3)
1.5 Handbook Configuration Check

1.5.1 List of the editions and of modified parts

The following table indicates the handbook parts new and modified with respect to the previous edition.

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<td>6. MAINTENANCE</td>
<td>n</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>DISMANTLING &amp; RECYCLING</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. DISMANTLING &amp; RECYCLING</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPENDICES</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HARDWARE SETTING DOCUMENTATION</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit documentation list</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANNEXES</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nothing envisaged</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** the edition of the enclosed documents (sections HARDWARE SETTING DOCUMENTATION and ANNEXES) is not subjected to configuration check.

1.5.2 Notes on Ed.01

Ed.01 created on July 2005 is the first validated and officially released issue of this Handbook.

1.5.3 Notes on Ed.02

Ed.02 created on February 2007 is the second validated and officially released issue of this Handbook.

1.5.4 Notes on Ed.03

Ed.03 created on April 2007 is the third validated and officially released issue of this Handbook.

1.5.4 Notes on Ed.04

Ed.04 created on August 2007 is the fourth validated and officially released issue of this Handbook.
2 COMPLIANCE WITH EUROPEAN NORMS

2.1 Electromagnetic Compatibility (EMC)

The CE markings printed on the product denote compliancy with the following Directives:

- 89/336/EEC of May 3rd, 1989 (EMC directives), amended:
  - by the 92/31/EEC Directive issued on April 28th, 1992
  - by the 93/68/EEC Directive issued on July 22nd, 1993
- ETS 300 386–1 V1.3.1 (Ed. 9/2001), "Other than Telecommunication Center"

WARNING

2.2 Safety

Compliancy to Safety Norms is declared in that the equipment satisfies standardized Norms:

- IEC 60950-1 ed.2001 for electrical safety
- EN 60950-1 ed.2001 for electrical safety
- EN 60825-2 ed.2000 for optical safety
- IEC 60825-2 ed.2000 for optical safety
3 SAFETY NORMS AND LABELS

3.1 First aid for electric shock

Do not touch the patient with bare hands until the circuit has been opened.

Open the circuit by switching off the line switches. If that is not possible, **protect yourself with dry material** and free the patient from the conductor.

**ARTIFICIAL RESPIRATION**

It is important to start mouth to mouth resuscitation at once and seek medical help immediately.

**TREATMENT OF BURNS**

This treatment should be used after the patient has regained consciousness. It can also be employed while the artificial respiration is being applied (in this case there should be at least two persons present).

**WARNING:**

- Do not attempt to remove his clothing from the burnt parts;
- Apply dry gauze on the burns;
- Do not apply ointments or other oily substances.
**Mouth to mouth resuscitation method**

<table>
<thead>
<tr>
<th></th>
<th>Step Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lay the patient supine with his arms parallel with the body, if the patient is laying on an inclined plane, make sure that his stomach is slightly lower than his chest. Open the patient's mouth and check that there are no extraneous bodies in his mouth (dentures, chewing-gum etc.).</td>
</tr>
<tr>
<td>2</td>
<td>Kneel beside the patient level with his head. Put a hand under the patient's head and one under his neck (see fig.) Lift the patient's head and let it recline backwards as far as possible</td>
</tr>
<tr>
<td>3</td>
<td>Shift the hand from the patient's neck to is chin; place your thumb between his chin and his mouth, the index along his jawbone, and keep the other fingers closed together (see fig.). While performing these operations take a good supply of oxygen by taking deep breaths with your mouth open.</td>
</tr>
<tr>
<td>4</td>
<td>With your thumb between the patient's chin and mouth keep his lips together and blow into his nasal cavities (see fig.)</td>
</tr>
<tr>
<td>5</td>
<td>While performing these operations observe if the patient's chest rises (see fig.) If not it is possible that his nose is blocked: in that case open the patient's mouth as much as possible by pressing on his chin with your hand, place your lips around his mouth and blow into his oral cavity. Observe if the patient's chest heaves. This second method can be used instead of the first even when the patient's nose is kept closed by pressing the nostrils together using the hand you were holding his head with. <strong>The patient's head must be kept sloping backwards as much as possible.</strong></td>
</tr>
<tr>
<td>6</td>
<td>Start with ten rapid expirations, hence continue at a rate of twelve/fifteen expirations per minute. Go on like this until the patient has regained consciousness, or until a doctor has ascertained his death.</td>
</tr>
</tbody>
</table>
3.2 Safety Rules

3.2.1 General Rules

- Before carrying out any installation, turn-up & commissioning, operation and maintenance operations carefully read the relevant Handbook and chapters.

- Observe safety rules
  - When equipment is operating nobody is allowed to have access inside on the equipment parts which are protected with Cover Plate Shields removable with tools.
  - In case of absolute need to have access inside, on the equipment parts when it is operating this is allowed exclusively to service personnel, where for Service Personnel or Technical assistance is meant:
    "personnel which has adequate Technical Knowledge and experience necessary to be aware of the danger that he might find in carrying out an operation and of the necessary measurements to reduce danger to minimum for him and for others".
    The Service Personnel can only replace the faulty units with spare parts.
    The Service Personnel is not allowed to repair: hence the access to the parts no specified is not permitted.
    The keys and/or the tools used to open doors, hinged covers to remove parts which give access to compartments in which are present high dangerous voltages must belong exclusively to the service personnel.
  - For the eventual cleaning of the external parts of the equipment, absolutely do not use any inflammable substance or substances which in some way may alter the markings, inscriptions ect.
  - It is recommended to use a slightly wet cleaning cloth.

- The Safety Rules stated in the handbook describe the operations and/or precautions to observe to safeguard service personnel during the working phases and to guarantee equipment safety, i.e., not exposing persons, animals, things to the risk of being injured/damaged.

- Whenever the safety protection features have been impaired, REMOVE POWER.
  To cut off power proceed to switch off the power supply units as well as cut off power station upstream (rack or station distribution frame).

- The safety rules described at the beginning of the handbook are distinguished by the following symbol and statement:

![SAFETY RULES](image)

3.2.2 Labels Indicating Danger, Forbiddance, Command

It is of utmost importance to follow the instructions printed on the labels affixed to the units and assemblies.

The labels have been affixed to indicate a dangerous condition. They may contain any standard-known symbol or any statement necessary to safeguard users and service personnel against the most common ones, specifically:

- dangerous electrical voltages
- harmful optical signals
- risk of explosion
- moving mechanical parts
- heat-radiating mechanical parts

Pay attention to the information stated in the following, and proceed as instructed.

The symbols presented in para.3.2.3 through 3.2.7 are all the possible symbols that could be present on Alcatel equipment, but are not all necessarily present on the equipment this handbook refers to.

3.2.3 Dangerous Electrical Voltages

3.2.3.1 Labelling

The following warning label is affixed next to dangerous voltages (>42.4 Vp; >60 Vdc).
If it is a Class 1 equipment connected to mains, then the label associated to it will state that the equipment will have to be grounded before connecting it to the power supply voltage, e.g.:

**WARNING !**
Ground protect the equipment before connecting it to mains
Make sure that power has been cut off before disconnecting ground protection.

3.2.3.2 Electrical safety: general rules

**DANGER! Possibility of personal injury:** carefully observe the specific procedures for installation / turn-up and commissioning / maintenance of equipment parts where a.c. or d.c. power is present, described in the relevant installation / turn-up and commissioning / maintenance documents and the following general rules:

a) Personal injury can be caused by -48 V dc (or by 220 V ac if envisaged in the equipment). Avoid touching powered terminals with any exposed part of your body.

b) Short circuiting, low-voltage, low-impedance, dc circuits can cause severe arcing that can result in burns and/or eye damage. Remove rings, watches, and other metal jewelry before working with primary circuits. Exercise caution to avoid shorting power input terminals.

3.2.3.3 Electrical safety: equipment specific data

Refer to para.5.1.2.

3.2.4 Harmful Optical Signals

3.2.4.1 Labelling

If the assembly or unit is fitted with a LASER, the labels must comply with the **IEC 60825-1** and -2 International Norms.

The symbol indicates the presence of a LASER beam. Danger level is stated within a rectangular label:
If the LASER is a Hazard Level 1, 1M product, the label depicting the symbol within a triangle is not compulsory.

If the LASER is a Hazard Level 3A product, the label depicting the symbol within a triangle is compulsory.

NOTE: the equipment may be provided with labels of a type other than the illustrated one (reason: previous standard).

The rectangular shaped label bears all the information needed, i.e.:

- LASER class
- Power emitted
- Wave length
- Ref. Norm
- Precautionary measures taken depend on LASER class
- Indications given on openings, panels and safety interlockers

### Example of power and length values

**HAZARD LEVEL 1 LASER PRODUCT**

- **INVISIBLE LASER RADIATION — DO NOT VIEW DIRECTLY — WITH OPTICAL INSTRUMENTS —**
- **HAZARD LEVEL 1M LASER PRODUCT —**
- \( P_{\text{max}} = 42.8 \text{mW} \)
- \( \lambda = 1300 \text{nm} \)
- \( \text{CW} \)

### 3.2.4.2 Optical safety: general rules

On handling optical equipments or units or cables always check that laser labels are properly affixed and that the system complies with applicable optical standards.

**DANGER! Possibility of eyes damage:** Invisible infrared radiations emitted by the fiber optic transmitters can cause eyes damages. Carefully observe the specific procedures for installation / turn-up and commissioning / maintenance of units containing laser devices or cables transporting optical signals, described in the relevant installation / turn-up and commissioning / maintenance documents and the following general rules:
a) Laser radiation is not visible by the naked eye or with laser safety glasses. Although it cannot be seen, laser radiation may be present.

b) Never look directly into an unterminated fiber optic connector or into a broken optical fiber cable, unless it is absolutely known that no laser radiation is present.

c) Never look at an optical fiber splice, cable or connector, unless it is absolutely known that no laser radiation is present.

d) All optical connectors, terminating either fibers and transmitters/receivers, are provided with protective covers that must always be used, as soon as possible, when any optical link is disconnected for installation/test/maintenance purposes or whatever operation.

e) Never look directly into an unterminated fiber optic connector or into a broken optical fiber cable by means of magnifiers/microscopes, unless it is absolutely known that no laser radiation is present. A magnifier/microscope greatly increases the damage hazard to the eyes.

f) Never point an unterminated optical fiber splice, cable or connector to other persons, unless it is absolutely known that no laser radiation is present.

g) Always remove electrical power from near and far optical transmitters before disconnecting optical links between the transmitter and the receiver.

h) Wearing of laser safety goggles or eyes shields is recommended for every person working on optical devices, whenever the above listed rules cannot be followed.

3.2.4.3 Optical safety: equipment specific data

Refer to paragraph 5.1.1.

3.2.5 Risks of Explosions

3.2.5.1 Labelling and safety instructions

This risk is present when batteries are used, and it is signalled by the following label:

![Explosion Warning]

Therefore, slits or apertures are made to let air circulate freely and allow dangerous gasses to downflow (battery-emitted hydrogen). A 417-IEC-5641 Norm. compliant label is affixed next to it indicating that the openings must not be covered up.
3.2.6 Moving Mechanical Parts

The following warning label is affixed next to the moving mechanical parts:

Before carrying out any maintenance operation see that all the moving mechanical parts have been stopped.

3.2.7 Heat-radiating Mechanical Parts

The presence of heat-radiating mechanical parts is indicated by the following warning label in compliance with IEC 417 Norm, Fig.5041:

As stated by IEC 950 Norm., para.1.4.7 mechanical parts which carry the above pictured label and that could inadvertently be touched, have a temperature $T$ established by the following formula:

$$(T - T_{amb}) \leq (D_{T_{max}} + 25° - T_{mra})$$

where:

- $T$: Temperature of the mechanical part measured at ambient temperature $T_{amb}$.
- $T_{amb}$: Ambient temperature during the test.
- $D_{T_{max}}$: Value defined by IEC 60950 Norm, Table 16 part 2a, para.5.1, and specified in the table below.
**T_mra**

The maximum room ambient temperature permitted by the equipment specification or 25 °C, whichever is greater.

Table 8.

<table>
<thead>
<tr>
<th>Operator-accessible parts</th>
<th>Maximum overtemperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>Glass, porcelain</td>
</tr>
<tr>
<td>Handle knob, etc., held or touched for short periods</td>
<td>35</td>
</tr>
<tr>
<td>Handles, knobs, etc., regularly held</td>
<td>30</td>
</tr>
<tr>
<td>Outer surface of the equipment that can be touched</td>
<td>45</td>
</tr>
<tr>
<td>Inner surface of the equipment that can be touched</td>
<td>45</td>
</tr>
</tbody>
</table>

**DANGER! Possibility of personal injury:** carefully observe the specific procedures for installation / turn-up and commissioning / maintenance of equipment parts where heat-radiating mechanical parts are present, described in the relevant installation / turn-up and commissioning / maintenance documents and the following general rule:

a) Personal injury can be caused by heat. Avoid touching powered terminals with any exposed part of your body.

3.2.8 Specific safety rules in this handbook

- The safety rules are specified in the following chapters:
  - Chapter 6 paragraph 6.1
  - Chapter 6 paragraph 6.5.2.1
  - Chapter 6 paragraph 6.6.1
4 OTHER NORMS AND LABELS

4.1 Electromagnetic Compatibility

The equipment’s EMC norms depend on the type of installation being carried out (cable termination, grounding etc.) and on the operating conditions (equipment, setting options of the electrical/electronic units, presence of dummy covers, etc.).

- Before starting any installation, turn-up & commissioning, operation and maintenance work refer to the relevant Handbook and chapters.
- The norms set down to guarantee EMC compatibility, are distinguished inside this handbook by the symbol and term:

  **ATTENTION** EMC NORMS.

4.1.1 General Norms - Installation

- All connections (towards the external source of the equipment) made with shielded cables use only cables and connectors suggested in this technical handbook or in the relevant Plant Documentation, or those specified in the Customer’s "Installation Norms." (or similar documents)
- Shielded cables must be suitably terminated
- Install filters outside the equipment as required
- Ground connect the equipment utilizing a conductor with proper dia. and impedance
- Mount shields (if utilized), previously positioned during the installation phase, but not before having cleaned and degreased it.
- Before inserting the shielded unit proceed to clean and degrease all peripheral surfaces (contact springs and connection points, etc.)
- Screw fasten the units to the subrack.
- To correctly install EMC compatible equipment follow the instructions given.

4.1.2 General Norms - Turn-up & Commissioning, Operation

- Preset the electrical units as required to guarantee EMC compatibility
- Check that the equipment is operating with all the shields properly positioned (dummy covers, ESD connector protections, etc.)
- To properly use EMC compatible equipment observe the information given

4.1.3 General Norms - Maintenance

- Before inserting the shielded unit, which will replace the faulty or modified unit, proceed to clean and degrease all peripheral surfaces (contact springs and connection points, etc.)
• Clean the dummy covers of the spare units as well.
• Screw fasten the units to the subrack.

4.2 Electrostatic Dischargers (ESD)
Before removing the ESD protections from the monitors, connectors etc., observe the precautionary measures stated. Make sure that the ESD protections have been replaced and after having terminated the maintenance and monitoring operations.

Most electronic devices are sensitive to electrostatic dischargers, to this concern the following warning labels have been affixed:

Observe the precautionary measures stated when having to touch the electronic parts during the installation/maintenance phases.

Workers are supplied with antistatic protection devices consisting of:

- an elasticized band worn around the wrist
- a coiled cord connected to the elasticized band and to the stud on the subrack.

4.3 Suggestions, notes and cautions
Suggestions and special notes are marked by the following symbol:

Suggestion or note....

Cautions to avoid possible equipment damage are marked by the following symbol:

TITLE...
(caution to avoid equipment damage)
4.4 Labels affixed to the Equipment

This chapter indicates the positions and the information contained on the identification and serial labels affixed to the equipment.

Figure 1. thru’ Figure 5. illustrate the most common positions of the labels on the units, modules and subracks.

Figure 6. thru’ Figure 12. illustrate the information (e.g., identification and serial No.) printed on the labels.

The table below relates the ref. numbers stated on the figures to the labels used.

Labelling depicted hereafter is for indicative purposes and could be changed without any notice.

Table 9. Label references

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Name of Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>label specifying item not on catalogue (P/N. and serial number). Refer to Figure 6.</td>
</tr>
<tr>
<td>2</td>
<td>label specifying item on catalogue (P/N. and serial number). Refer to Figure 7.</td>
</tr>
<tr>
<td>3</td>
<td>item identification label – item on catalog. Refer to Figure 8.</td>
</tr>
<tr>
<td>4</td>
<td>label identifying the equipment. Refer to Figure 9.</td>
</tr>
<tr>
<td>5</td>
<td>label identifying compliance with CE, WEEE and China RoHS Directives. Refer to Figure 10. thru’ Figure 12.</td>
</tr>
</tbody>
</table>

On contract basis, customized labels can be affixed to the equipment.

Standard labels can be affixed to any position on the equipment, as required by the Customer. However, for each of the above are applied the rules defined by each individual Customer.
NOTE: The above reference numbers are detailed on Table 9.

Figure 1. Subrack label

NOTE: The above reference numbers are detailed on Table 9.

Figure 2. Labels on units with standard cover plate
NOTE: The above reference numbers are detailed on Table 9.

Figure 3. Modules label

NB.1 = The label is present on the p.c.s. component side

NOTE: The above reference numbers are detailed on Table 9.

Figure 4. Internal label for Printed Board Assembly
NB. 1 = The label is present on p.c.s. components side or rear side on the empty spaces.

NOTE: The above reference numbers are detailed on Table9.

Figure5. Back panels internal label

Figure6. Label specifying item not on catalogue (P/N. and serial number)
Figure 7. Label specifying item on catalogue (P/N. and serial number)

Figure 8. Item identification labels - item on catalog

Figure 9. Label identifying the equipment (example)
Figure 10. CE label

Figure 11. WEEE label

Figure 12. China RoHS label
## 5 LIST OF ABBREVIATIONS

### Table 10. List of Abbreviations

<table>
<thead>
<tr>
<th>ABBREVIATION</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABIL</td>
<td>Enabling</td>
</tr>
<tr>
<td>ABN</td>
<td>Abnormal</td>
</tr>
<tr>
<td>ADM</td>
<td>Add/Drop Multiplexer</td>
</tr>
<tr>
<td>AIS</td>
<td>Alarm indication Signal</td>
</tr>
<tr>
<td>ALS</td>
<td>Automatic Laser Shutdown</td>
</tr>
<tr>
<td>APD</td>
<td>Avalanche Photodiode</td>
</tr>
<tr>
<td>APS</td>
<td>Automatic Protection Switching</td>
</tr>
<tr>
<td>AND</td>
<td>Alarm on both station batteries</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards International</td>
</tr>
<tr>
<td>ASIC</td>
<td>Application Specific Integrated Circuit</td>
</tr>
<tr>
<td>ATM</td>
<td>Asynchronous Transfer Module</td>
</tr>
<tr>
<td>ATTD</td>
<td>Attended (alarm storing)</td>
</tr>
<tr>
<td>AU</td>
<td>Administrative Unit</td>
</tr>
<tr>
<td>AUG</td>
<td>Administrative Unit Group</td>
</tr>
<tr>
<td>AUOH</td>
<td>AU Pointer</td>
</tr>
<tr>
<td>AUX</td>
<td>Auxiliary</td>
</tr>
<tr>
<td>AU4</td>
<td>Administrative unit - level 4</td>
</tr>
<tr>
<td>BATT</td>
<td>Battery</td>
</tr>
<tr>
<td>BER</td>
<td>Bit Error Rate</td>
</tr>
<tr>
<td>BIP</td>
<td>Bit Interleaved Parity</td>
</tr>
<tr>
<td>BNC</td>
<td>Bayonet Not Coupling</td>
</tr>
<tr>
<td>C</td>
<td>Storing command</td>
</tr>
<tr>
<td>CE</td>
<td>European Conformity</td>
</tr>
<tr>
<td>CO</td>
<td>Central Office</td>
</tr>
<tr>
<td>CPE</td>
<td>Customer premises equipment</td>
</tr>
<tr>
<td>CT</td>
<td>Craft Terminal</td>
</tr>
<tr>
<td>CMI</td>
<td>Code Mark Inversion</td>
</tr>
<tr>
<td>COAX</td>
<td>Coaxial</td>
</tr>
<tr>
<td>CPI</td>
<td>Incoming parallel contacts</td>
</tr>
<tr>
<td>CPO</td>
<td>Outgoing parallel contacts</td>
</tr>
<tr>
<td>CPU</td>
<td>Central Processing Unit (referred to Controller equipment unit or Microprocessor)</td>
</tr>
<tr>
<td>C12/C3/C4</td>
<td>1st, 3rd and 4th level container</td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current</td>
</tr>
<tr>
<td>DCC</td>
<td>Data Communication Channel</td>
</tr>
<tr>
<td>DCE</td>
<td>Data Circuit Terminating Equipment</td>
</tr>
<tr>
<td>DPLL</td>
<td>Digital Phase Locked Loop</td>
</tr>
<tr>
<td>DTE</td>
<td>Data Terminal Equipment</td>
</tr>
<tr>
<td>EBU</td>
<td>European Broadcasting Union</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Form</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
</tr>
<tr>
<td>EC</td>
<td>Equipment Controller</td>
</tr>
<tr>
<td>ECC</td>
<td>Embedded Control Channel</td>
</tr>
<tr>
<td>ECT</td>
<td>Equipment Craft Terminal</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>EMI</td>
<td>Electromagnetic interference</td>
</tr>
<tr>
<td>EOW</td>
<td>Engineering Order Wire</td>
</tr>
<tr>
<td>EPS</td>
<td>Equipment Protection Switching</td>
</tr>
<tr>
<td>ESD</td>
<td>Electrostatic discharges</td>
</tr>
<tr>
<td>ETSI</td>
<td>European Telecommunication Standards Institute</td>
</tr>
<tr>
<td>E2PROM</td>
<td>Electrically erasable programmable read only memory</td>
</tr>
<tr>
<td>F</td>
<td>Interface F (for Craft Terminal) or Fuse</td>
</tr>
<tr>
<td>FEBE</td>
<td>Far End Block Error</td>
</tr>
<tr>
<td>FEPROM</td>
<td>Flesh Electrically erasable programmable read only memory</td>
</tr>
<tr>
<td>FERF</td>
<td>Far End Receive Failure</td>
</tr>
<tr>
<td>FPGA</td>
<td>Field Programmable Gate Array</td>
</tr>
<tr>
<td>GA</td>
<td>Gate Array</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>HDBK</td>
<td>Handbook</td>
</tr>
<tr>
<td>HDB3</td>
<td>High Density Bipolar Code</td>
</tr>
<tr>
<td>HIGHREFL</td>
<td>High Optical reflections</td>
</tr>
<tr>
<td>HOA</td>
<td>High Order Adaptation</td>
</tr>
<tr>
<td>HOI</td>
<td>High Order Interface</td>
</tr>
<tr>
<td>HPC</td>
<td>High order Path Connection</td>
</tr>
<tr>
<td>HPT</td>
<td>Higher Order Path Termination</td>
</tr>
<tr>
<td>HPOM</td>
<td>High order Path Overhead Monitoring</td>
</tr>
<tr>
<td>HSUT</td>
<td>High order Supervisory Unequipped Termination</td>
</tr>
<tr>
<td>HW</td>
<td>Hardware</td>
</tr>
<tr>
<td>ICS</td>
<td>Item Change Status</td>
</tr>
<tr>
<td>ID</td>
<td>Identification signals</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Committee</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronic Engineering</td>
</tr>
<tr>
<td>IN</td>
<td>Input</td>
</tr>
<tr>
<td>IND</td>
<td>Indicative alarm</td>
</tr>
<tr>
<td>INT</td>
<td>Internal Local Alarms</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for standardization</td>
</tr>
<tr>
<td>ITU-T(*)</td>
<td>International Telecommunication Union-Telecommunication Sector</td>
</tr>
<tr>
<td>JE1</td>
<td>Joint Engineering</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>LDSSHUT</td>
<td>Command for ALS</td>
</tr>
<tr>
<td>LED</td>
<td>Light emitting diode</td>
</tr>
<tr>
<td>LOF</td>
<td>Loss of alignment</td>
</tr>
<tr>
<td>LOI</td>
<td>Low Order Interface</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>LOM</td>
<td>Loss Of Multiframe</td>
</tr>
<tr>
<td>LOP</td>
<td>Loss Of Pointer</td>
</tr>
<tr>
<td>LOS</td>
<td>Loss of signal</td>
</tr>
<tr>
<td>LPA</td>
<td>Lower order path adaption</td>
</tr>
<tr>
<td>LPC</td>
<td>Lower order path connection</td>
</tr>
<tr>
<td>LPOM</td>
<td>Lower Order Path Monitoring</td>
</tr>
<tr>
<td>LPT</td>
<td>Lower order path termination or Loopback equipment side (local)</td>
</tr>
<tr>
<td>LSUT</td>
<td>Lower order Supervisory Unequipped Termination</td>
</tr>
<tr>
<td>M</td>
<td>Tagblock or Alarm storing</td>
</tr>
<tr>
<td>MCF</td>
<td>Message Communication Function</td>
</tr>
<tr>
<td>MLM</td>
<td>Multi Longitudinal mode</td>
</tr>
<tr>
<td>MSA</td>
<td>Multiplex section adaptation</td>
</tr>
<tr>
<td>MSOH</td>
<td>Multiplex Section Overhead</td>
</tr>
<tr>
<td>MSP</td>
<td>Multiplex section protection</td>
</tr>
<tr>
<td>MST</td>
<td>Multiplex section termination</td>
</tr>
<tr>
<td>NRZ</td>
<td>No return to zero</td>
</tr>
<tr>
<td>NURG</td>
<td>Not urgent alarm</td>
</tr>
<tr>
<td>OH-BUS</td>
<td>Dedicated housekeeping stream</td>
</tr>
<tr>
<td>OMSN</td>
<td>Optinex MultiService Node</td>
</tr>
<tr>
<td>OOF</td>
<td>Out Of Frame</td>
</tr>
<tr>
<td>OR</td>
<td>Logic sum/Loss of only one station battery</td>
</tr>
<tr>
<td>OS</td>
<td>Operating system</td>
</tr>
<tr>
<td>OUT</td>
<td>Output</td>
</tr>
<tr>
<td>P/S</td>
<td>Parallel/Serial converter</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>PDH</td>
<td>Plesiochronous Digital Hierarchy</td>
</tr>
<tr>
<td>PFAIL</td>
<td>Power supply failure</td>
</tr>
<tr>
<td>PI</td>
<td>Physical interface</td>
</tr>
<tr>
<td>PJE</td>
<td>Pointer Justification Event</td>
</tr>
<tr>
<td>PPI</td>
<td>Plesiochronous Physical interface</td>
</tr>
<tr>
<td>POH</td>
<td>Path Overhead</td>
</tr>
<tr>
<td>PMMF</td>
<td>Physical Machine Management Function</td>
</tr>
<tr>
<td>PPS</td>
<td>Path Protection Switching</td>
</tr>
<tr>
<td>PRBS</td>
<td>Pseudo Random Binary Signal</td>
</tr>
<tr>
<td>PR_EA</td>
<td>Packet Ring Edge Aggregator</td>
</tr>
<tr>
<td>PWALM</td>
<td>Power supply alarm</td>
</tr>
<tr>
<td>PWANDOR</td>
<td>ANDOR/3 failure</td>
</tr>
<tr>
<td>Q2/QB2</td>
<td>TMN Interface with B2 protocol. Interface towards plesiochronous equipment</td>
</tr>
<tr>
<td>Q3/QB3</td>
<td>TMN Interface with B3 protocol. Interface towards TMN</td>
</tr>
<tr>
<td>R</td>
<td>Reset command /General alarm</td>
</tr>
<tr>
<td>RAI</td>
<td>Remote Alarm Indication</td>
</tr>
<tr>
<td>RECC</td>
<td>Recommendation</td>
</tr>
<tr>
<td>RAM</td>
<td>Random Access Memory</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>RDI</td>
<td>Remote Defect Indication</td>
</tr>
<tr>
<td>REI</td>
<td>Remote Error Indication</td>
</tr>
<tr>
<td>RCK</td>
<td>Received clock</td>
</tr>
<tr>
<td>REF</td>
<td>Reference</td>
</tr>
<tr>
<td>REL</td>
<td>Release</td>
</tr>
<tr>
<td>RIBUS</td>
<td>Remote Inventory BUS</td>
</tr>
<tr>
<td>RMS</td>
<td>Root Mean Square</td>
</tr>
<tr>
<td>RNURG</td>
<td>Not urgent Alarm command. Lights up the relative rack red LED</td>
</tr>
<tr>
<td>RSOH</td>
<td>Regenerator Section Overhead</td>
</tr>
<tr>
<td>RST</td>
<td>Regenerator Section Termination</td>
</tr>
<tr>
<td>RURG</td>
<td>Urgent Alarm command. Lights up the relative rack red LED</td>
</tr>
<tr>
<td>Rx</td>
<td>Reception</td>
</tr>
<tr>
<td>SC</td>
<td>Shelf Controller</td>
</tr>
<tr>
<td>SDH</td>
<td>Synchronous Digital Hierarchy</td>
</tr>
<tr>
<td>SETG</td>
<td>Synchronous Equipment Timing Generation function</td>
</tr>
<tr>
<td>SLM</td>
<td>Single Longitudinal Mode</td>
</tr>
<tr>
<td>SM</td>
<td>Single Mode/Synchronous Mux</td>
</tr>
<tr>
<td>SNCP/I (***)</td>
<td>Subnetwork Connection Protection Inherent</td>
</tr>
<tr>
<td>SOH</td>
<td>Section Overhead</td>
</tr>
<tr>
<td>S/P</td>
<td>Serial/Parallel Converter</td>
</tr>
<tr>
<td>SPI</td>
<td>Synchronous Physical Interface</td>
</tr>
<tr>
<td>SSF</td>
<td>Server Signal Fail</td>
</tr>
<tr>
<td>SQ</td>
<td>Squelch</td>
</tr>
<tr>
<td>STM-0/STM-1</td>
<td>Synchronous Transport Module, levels 0 etc.</td>
</tr>
<tr>
<td>SW</td>
<td>Software</td>
</tr>
<tr>
<td>TANC</td>
<td>Remote alarm due to failure of all power supply units</td>
</tr>
<tr>
<td>TD</td>
<td>Layout drawing</td>
</tr>
<tr>
<td>TIM</td>
<td>Trace Identifier Mismatch</td>
</tr>
<tr>
<td>TMN</td>
<td>Telecommunication Management Network</td>
</tr>
<tr>
<td>TOR</td>
<td>Remote alarm indicating loss of one of the station batteries</td>
</tr>
<tr>
<td>TORC</td>
<td>Remote alarm due to a faulty/missing power supply unit</td>
</tr>
<tr>
<td>TSD</td>
<td>Trail Signal Degrade</td>
</tr>
<tr>
<td>TSF</td>
<td>Trail Signal Fail</td>
</tr>
<tr>
<td>TTF</td>
<td>Transport Terminal Function</td>
</tr>
<tr>
<td>TUG2/3</td>
<td>Tributary unit group, level 2,3</td>
</tr>
<tr>
<td>TUOH</td>
<td>Tributary Unit Overhead</td>
</tr>
<tr>
<td>TUP/UP</td>
<td>Equipment Controller remote alarm</td>
</tr>
<tr>
<td>TU12/TU3</td>
<td>Tributary unit level 12, 3</td>
</tr>
<tr>
<td>TX</td>
<td>Transmission</td>
</tr>
<tr>
<td>URG</td>
<td>Urgent</td>
</tr>
<tr>
<td>VCXO/VCO</td>
<td>Voltage controlled oscillator</td>
</tr>
<tr>
<td>VC12/VC3/VC4</td>
<td>Virtual Container, levels 12,3,4</td>
</tr>
<tr>
<td>VMMF</td>
<td>Virtual Machine Management Function</td>
</tr>
<tr>
<td>WAN</td>
<td>Wide Access Network</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------</td>
</tr>
</tbody>
</table>

**NOTES -**

(*) Owing to change of name, all documents issued by the two ITU committees (CCIR ND CCITT) in 1992 (and in some cases even before then) are classified as ITU-R and ITU-T, respectively.

(**) Substitutes PPS
6 GENERAL ON ALCATEL CUSTOMER DOCUMENTATION

6.1 Products, product–releases, versions and Customer Documentation

A "product" is defined by the network hierarchical level where it can be inserted and by the whole of performance and services for which it is meant.

A "product" evolves through successive "product–releases" which are the real products marketed for their delivery at a certain "product–release" availability date.

So, a "product-release" defines a set of hardware components and a software package which, as a whole, identify the possible network applications and the equipment performance which the specific "product–release" has been designed, engineered and marketed for.

In some cases a "product-release" has further development steps, named "versions", that are born to improve or add some performance (mainly software) with respect to the previous version, or for bug fixing purposes.

A "product-release" has its own standard Customer Documentation, composed by one or more handbooks.

A new "version" of a "product–release" may or may not produce a change in the status of the Customer Documentation set, as described in para. 6.4

6.2 Handbook supply to Customers

Handbooks are not automatically delivered together with the equipment they refer to. The number of handbooks per type to be supplied must be decided at contract level.

6.3 Aims of standard Customer Documentation

Standard Customer Documentation, referred to hereafter, must be always meant as plant–independent. Plant–dependent documentation, if envisaged by the contract, is subjected to commercial criteria as far as contents, formats and supply conditions are concerned (plant–dependent documentation is not described here).

Standard hardware and software documentation is meant to give the Customer personnel the possibility and the information necessary for installing, commissioning, operating and maintaining the equipment according to Alcatel-Telecom Laboratory design choices.

In particular: the contents of the handbooks associated to the software applications focus on the explanation of the man–machine interface and of the operating procedures allowed by it; maintenance is described down to faulty PCB location and replacement.

Consequently, no supply to the Customers of design documentation (like PCB hardware design and production documents and files, software source programs, programming tools, etc.) is envisaged.

The handbooks concerning hardware (usually the "Technical Handbook") and software (usually the "Operator’s Handbook") are kept separate in that any product changes do not necessarily concern their contents.

For example, only the Technical Handbook might be revised because of hardware configuration changes (e.g., replacing a unit with one having different P/N but the same function). On the other hand, the Operator’s Handbook is updated because of a new software version but which does not concern the Technical Handbook as long as it does not imply hardware modifications. However, both types of handbooks can be updated to improve contents, correct mistakes, etc..

6.4 Handbook Updating

The handbooks associated to the "product-release" are listed in para.1.3

Each handbook is identified by:

- the name of the "product–release" (and "version" when the handbook is applicable to the versions starting from it, but not to the previous ones),
• the handbook name,
• the handbook P/N,
• the handbook edition (usually first edition=01),
• the handbook issue date. The date on the handbook does not refer to the date of print but to the date on which the handbook source file has been completed and released for the production.

6.4.1 Changes introduced in the same product–release (same handbook P/N)

The edition and date of issue might change on future handbook versions for the following reasons:

• only the date changes (pointed out in the Table of Contents) when modifications are made to the editorial system not changing the technical contents of the handbook.

• the edition, hence the date, is changed because modifications made concern technical contents. In this case:
  • the chapters modified with respect to the previous edition are listed in Table7;
  • in affected chapters, revision bars on the left of the page indicate modifications in text and drawings.

Changes concerning the technical contents of the handbook cause the edition number increase (e.g. from Ed.01 to Ed.02). Slight changes (e.g. for corrections) maintain the same edition but with the addition of a version character (e.g. from Ed.02 to Ed.02A). Version character can be used for draft or proposal editions.

NOTES FOR HANDBOOKS RELEVANT TO SOFTWARE APPLICATIONS

Handbooks relevant to software applications (typically the Operator's Handbooks) are not modified unless the new software "version" distributed to Customers implies man-machine interface changes or in case of slight modifications not affecting the understanding of the explained procedures.

Moreover, should the screen prints included in the handbook contain the product–release's "version" marking, they are not replaced in the handbooks related to a subsequent version, if the screen contents are unchanged.

6.4.1.1 Supplying updated handbooks to Customers

Supplying updated handbooks to Customers who have already received previous issues is submitted to commercial criteria.

By updated handbook delivery it is meant the supply of a complete copy of the handbook new issue (supplying errata-corrige sheets is not envisaged).

6.4.2 Changes due to new product version

A new product version changes the handbook P/N and the edition starts from 01.

In this case the modified parts of the handbook are not listed.

6.5 Customer documentation on CD-ROM

In the following by 'CD-ROM' it is meant 'Customer Documentation on CD-ROM'

6.5.1 Contents, creation and production of a CD-ROM

In most cases, a CD-ROM contains in read-only eletronic format the documentation of one product-release(-version) and for a certain language.
In some other cases, the same CD-ROM can contain the documentation of different product-release(version)s for a certain language.

As a general rule:

- **CD-ROMs for Network Management products do not contain:**
  - the Installation Guides
  - the documentation of system optional features that Customers could not buy from Alcatel together with the main applicative SW.

- **CD-ROMs for Network Elements products do not contain:**
  - the documentation of system optional features (e.g. System Installation Handbooks related to racks that Customers could not buy from Alcatel together with the main equipment).

A CD-ROM is obtained collecting various handbooks and documents in .pdf format. Bookmarks and hyperlinks make the navigation easier. No additional information is added to each handbook, so that the documentation present in the CD-ROMs is exactly the same the Customer would receive on paper.

The files processed in this way are added to files/images for managing purpose and a master CD-ROM is recorded.

Suitable checks are made in order to have a virus-free product.

After a complete functional check, the CD-ROM image is electronically transferred to the archive of the Production Department, so that the CD-ROM can be produced and delivered to Customers.

### 6.5.2 Use of the CD-ROM

The CD-ROM can be used both in PC and Unix WS environments.

The CD-ROM starts automatically with autorun and hyperlinks from the opened “Index” document permit to visualize the .pdf handbooks

Other hyperlinks permit to get, from the Technical handbooks, the specific .pdf setting documents.

In order to open the .pdf documents Adobe Acrobat Reader Version 4.0 (minimum) must have been installed on the platform.

The CD-ROM doesn’t contain the Adobe Acrobat Reader program. The Customer is in charge of getting and installing it.

ReadMe info is present on the CD-ROM to this purpose.

Then the Customer is allowed to read the handbooks on the PC/WS screen, using the navigation and zooming tools included in the tool, and to print selected parts of the documentation through a local printer.

### 6.5.3 CD-ROM identification

Each CD-ROM is identified:

1) by the following external identifiers, that are printed on the CD-ROM upper surface:
   - the name of the “product-release(s)” (and “version” if applicable)
   - a writing indicating the language(s),
   - the CD-ROM P/N,
   - the CD-ROM edition (usually first edition=01)

2) and, internally, by the list of the source handbooks and documents (P/Ns and editions) by whose collection and processing the CD-ROM itself has been created.
6.5.4 CD-ROM updating

The list of source handbook/document P/Ns-editions indicated in previous para. 6.5.3 point 2, in association with the CD-ROM's own P/N-edition, is also loaded in the Alcatel-Information-System as a structured list. Whenever a new edition of any of such handbooks/documents is released in the Alcatel archive system, a check in the Alcatel-Information-System is made to identify the list of CD-ROMs that must be updated to include the new editions of these handbooks/documents. This causes the planning and creation of a new edition of the CD-ROM. Updating of CD-ROMs always follows, with a certain delay, the updating of the single handbooks composing the collection.
DESCRIPTIONS
1 General

1.1 Introduction to the equipment

1642EMC (Edge Multiplexer Compact) is the compact 155Mb/s SDH optical transmission equipment. The equipment is designed according to the ITU-T recommendations, Chinese national standard as well as relevant standards and requirements of the CCSA (Chinese Communication Standard Association). All the technical specifications of the equipment satisfy with relevant standards and comply with the criterion for SDH equipment access network.

The newest designed components are used for the core part of the system to ensure stability and reliability of the system. The ASIC chips, which are independently developed, are used as fully as possible to replace the special chips and to minimize the product costs.

1642EMC equipment can form a standard transmission network with any other SDH transmission equipment, such as 622M, 2.5G, 10G, through SDH interface. It can also form various telecommunication networks with telephone exchange, Ethernet switch, various access network equipment, mobile base stations and switch equipment via PDH and Ethernet interface.

1642EMC characteristics:

- Flexible networking topology
  1642EMC is an integrated STM-1 compact equipment of SDH optical transmission series, with flexible networking capability. It can be configured as a Terminal Multiplexer or as an ADM, or as a Cross-Connect node. It is suitable for various on-site networking and supports point-to-point, link, ring, star and other network topology structures as well as multiple complex network topology structures, such as ring-with-link, etc.

- Flexible system configuration
  STM-1 interface: uses different optical module (SFPM module or OM1 module) or electrical module, which can provide different optical interfaces such as S1.1, L1.1 and L1.2, or an electrical interface.
  E1 interface: supports 14 channels 75 Ohm or 120 Ohm E1 interfaces on the main board, provides 8, 28 or 32 channels (only 120 Ohm), 75 Ohm or 120 Ohm E1 interfaces in the service slots if uses different 2M interface boards to meet different requirements.
  E3/DS3 and Ethernet interfaces can also be provided in the same equipment.

- Complete and rapid protection mechanism
  Various Network Protection mechanisms are provided (linear 1+1 MSP, SNCP/I and Drop&Continue, etc.). These features allow to insert the 1642EMC directly into unprotected or protected SDH networks.

- Provide 4X4 high order (VC4) /low order (VC12 and VC3) cross connect capacity
  The cross connect unit can achieve the service cross connect between any accessed units, and can support through mode, branching mode and broadcasting mode for service configuration.

- Reliable clock synchronization performance
  The equipment can provide three clock operation modes: tracking synchronization mode, synchronization maintaining mode and internal free oscillation mode to ensure high quality of the equipment clock and to provide optimal synchronization for the network. All the specifications comply with the ITU-T G.813 recommendations.

- Abundant and flexibly configured paths for network management data and customer data
  The system uses RSOH and MSOH overhead bytes in the SDH frame structure to manage and maintain the equipment in compliance with the ITU-T recommendations. Each network element provides 4 ECC network management channels and D1-D3 or D4-D12 can be selected through the network management configuration as the data channels for network management. The network management PC can perform network management and configuration through F interface.
E1 byte is used for EOW telephones and E2 and F1 bytes which support by OT1B1 board on service slot are 
used for providing customers with transparent data transmission paths. The maximum data transmission rate 
is 19.2 Kbit/s. F3 byte can also be used for transmission of EOW telephones through network management 
configuration.

- Complete network management system
  The network management system is able to manage the equipment configuration, failure performance and 
end-to-end line management of the network element in multiple sub-networks within one area. 
The management and maintenance of the network management mainly include alarm report, status monitor, 
configuration of software and equipment, configuration and connection of network elements, service 
configuration, performance management and download management of software, etc. The system also 
conveniently supports the software upgrading remotely and locally.
  The internal alarm of each network element and the alarm of each single board can be displayed via the 
alarm indicating lamp on the panel and the alarm of every single board can be inquired through the network 
management.

- Small volume, light, high cost-efficiency and easy installation and maintenance.
  The system is of 19-inch compact structure, 1U height and the overall dimension is 44mm \( \times \) 260mm \( \times \) 
440mm. The system mainly consists of the main control board at right side and service unit at left side.
  The equipment provides three power supply boards: -24VDC or -48VDC or 220V/230VAC, and double input 
power supply protection mechanism can be used for DC power supply input. The single boards support hot 
plugging for easy installation and maintenance.

![Figure13. Physical view of 1642EMC equipment](image)

As shown in Figure13. the equipment has only one layer structure. The right side of the mini box is the main 
unit which is fixed on the box. It mainly supports two STM-1 optical or electrical interfaces, 14*E1 (75Ohm or 
120 Ohm) interfaces without K20 protection, a pair of clock input/output interface, two inputs/outs house 
keeping function. The equipment supports AC220V, -48VDC and -24VDC power input and supports DC 
power (input interface) redundancy. There is a service slot on the left side of the box. The service boards in 
the service slot support hot plugging. The power-on and power-off setting can be performed separately at 
service slot through the network management. The equipment can provide multiple different services by 
inserting different types of service boards in service slot through the network management configuration. The 
accessible service includes PDH signals and Ethernet services.

The types of service interface board mainly include:
- E1RCB8: 8-channel E1 (2.048 Mb/s) coaxial interface board (75 Ohm), with 2M clock re-timing function.
- E1B8: 8-channel E1 (2.048 Mb/s) 2mm pin interface board (75 Ohm) with protection of lightening strike 
- E1B28: 28-channel E1 (2.048 Mb/s) 2mm pin interface board (75 Ohm) with protection of lightening 
  strike
- SE1B8: 8-channel E1 (2.048 Mb/s) 2mm pin interface board (75 Ohm), 2M interface.
- SE1B28: 28-channel E1 (2.048 Mb/s) 2mm pin interface board (75 Ohm), 2M interface.
- DE1B8: 8-channel E1 (2.048 Mb/s) 2mm pin interface board (120Ohm) with protection of lightening 
  strike
DE1B28: 28-channel E1 (2.048 Mb/s) 2mm pin interface board (120Ohm), with protection of lightening strike
SDE1B8: 8-channel E1 (2.048 Mb/s) 2mm pin interface board (120Ohm), 2M interface.
DE1JB8: 6-channel E1 (2.048 Mb/s) RJ45 interface board (120Ohm), 2M interface.
SDE1B28: 28-channel E1 (2.048 Mb/s) 2mm pin interface board (120Ohm), 2M interfaces.
DE1B32: 32-channel E1 (2.048 Mb/s) 2mm pin interface board (120Ohm), 2M interfaces.
E3B1: 1 port E3 (34Mb/s) interface board.
DS3B1: 1 port DS3 (45Mb/s) interface board.
ISA-ES1 8FE: 8 ports 10M/100M Ethernet electrical interface board.
ISA-ES1 3FE: 3 ports 10M/100M Ethernet interface board (1*LX+2*TX).
ISA-LES1 3FE: 3 ports 10M/100M low cost Ethernet interface board (1*LX+2*TX).
OT1B1: 1 channel STM-1 optical interface board.

The whole external interfaces of the equipment are as follows:
- STM1 optical interface
- STM1 electrical interface
- 2Mb/s balanced (75Ohm) and unbalanced (120Ohm) interface
- 1X34 Mb/s or 1X45 Mb/s interface
- 2/6/8 port 10M/100M Ethernet electrical interfaces.
- 1 port 100M Ethernet optical interfaces
- F interface (RJ45): Locally-connected PC is used for the network management of the whole system.
- Q interface (RJ45): use 10M/100M Ethernet protocol to provide high-speed communication channel.
- Alarm input interface (RJ45): provide two alarm input for the external equipment.
- Alarm output interface (RJ45): provide two alarm output interface.
- 2Mbit/s external clock input/output interface
- Debug interface
- -24V/-48V DC or 220V/230V AC power supply interface.

Please refer to Chapter Two for the description of the overall structure and external interfaces of the equipment.
Please refer to Chapter Four for detailed description of the parts of the system.

1.2 Access network

1642EMC is optical synchronous transmission equipment complying with the ITU-T recommendations as one of the Alcatel products. Some of the functional units in the equipment have been extensively used in other Alcatel SDH communication equipment.
1642EMC provides abundant service interfaces and the accessible services include multiple PDH signals and Ethernet services, and it also supports the mixed transmission of multiple PDH signals and Ethernet services in the same equipment.
1642EMC can form a standard transmission network with other standard SDH transmission equipment through SDH interfaces and can also form a communication network with access network equipment, GSM mobile cellular base stations, ETS radio access base stations and router through SDH interfaces to realize multiple network structures such as chain, ring and star topology, etc. and it provides complete protection functions.

1.3 Equipment configuration examples

The service slot of 1642EMC can be inserted with different service boards and each network element has abundant service interface types because of multiple types of service boards. 3 different configuration modes are given below:
• **E1 interface configuration**

Insert 32-channel E1 service interface boards into the service slot (taking DE1B32 as the example), and it can provide a maximum of 32 channels 120Ohm 2M interface on service slot and 14 channels 75 Ohm or 120 Ohm 2M interface on main board, please shown as in the following Figure14. Note: PBX is the private branch exchange.

![Figure14. Typical interface configuration I](image1)

• **Configuration of STM-1 optical tributary interface**

As shown in Figure15. below, insert one STM1 interface (OT1B1) boards into the service slot. Maximum 14 channels 75Ohm or 120 Ohm 2M interface on main board and 3 STM-1 interfaces ( two on main board and one on service slot) can be provided in the maximum and multiple network topology structures such as ring-with-chain or star topology can be configured.

![Figure15. Typical interface configuration II](image2)

• **Multi-service interface configuration**
As shown in Figure 16, insert one Ethernet interface board (taking ISA-ES1 8FE as an example). 14 channels 2M interfaces (75 Ohm or 120 Ohm), 2 STM-1 (optical or electrical) interfaces on the main board and 8 Ethernet interfaces can be provided to form the ring-with-chain network topology structure, and multiple different services can be provided on the network element.

![Diagram](image)

**Figure 16. Typical interface configuration III**

### 1.4 Equipment application examples

Note: SDH N.E. refers to SDH network element, which can be either the other vendor's SDH equipment or 1642 EMC equipment. If other Alcatel SDH is used, the network management system can manage each network element management system.

- **Connection between SDH system and PDH system**
  As shown in Figure 17.

![Diagram](image)

**Figure 17. Basic application connection diagram**

- **The SDH system chain network topology structure**
  As indicated in Figure 18.
• The SDH system ring network topology structure
  As indicated in Figure 19.

Figure 19. The ring network topology structure

• The SDH system star network topology structure
  As indicated in Figure 20.

Figure 20. The star network topology structure
- The SDH system ring-with-chain network topology structure
As indicated in Figure 21.

![Diagram of the ring-with-chain network topology structure](image)

Figure 21. The ring-with-chain network topology structure

1.5 Network protection

The relationship between the network application with their own protection and the configuration modes is summed up in Table 11.

Table 11. Network application versus configuration modes

<table>
<thead>
<tr>
<th>Network application</th>
<th>Network Protection Scheme</th>
<th>NE Configuration</th>
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<td>Point to Point</td>
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<td>MSP</td>
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<td>Ring</td>
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<td>√</td>
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<tr>
<td>Hub and Meshed</td>
<td>MSP &amp; SNCP</td>
<td>√</td>
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</tbody>
</table>

1.6 Equipment power feeding

1642EMC has three power feeding modes: -24VDC or -48VDC or 220V/230VAC. As shown in Figure 13, according to customers’ requirements, different power supply board is fixed in the equipment to provide three different feeding modes. -24V/48VDC power supply board which support DC power (input interface) redundancy and 220V/230VAC power supply interface board have over-voltage and over-current protection devices.
### 2 Physical configuration

In all this document, three types of boards will be distinguished:

- **service board**: it is a board containing the signal physical interfaces (electrical connectors)
- **main board**: it is the board that performs the SDH elaboration of the signal
- **module (electrical or optical)**: it is a particular plug-in card (of small dimensions) that is inserted on the front panel of some particular boards.

This Chapter illustrates the physical structure, layout and composition, coding and partition of the Equipment and Fans subrack.

**EQUIPMENT:**

The Equipment Shelf rear view is illustrated in Figure 22.

The Equipment Shelf front view for DC48V/24V and AC220V/230V is illustrated in Figure 23. and Figure 24.

The main part code and partition are listed in Table 12

The accessories codes and partition are listed in Table 13

The Equipment Slot connection layout is illustrated in Figure 25.

**NOTES:**

The explanatory notes are reported in Table 14

**UNITS FRONT VIEW:**

For the units front view refer to para 2.4

**N.B.** Table 12 contains the units of current equipment release. Units belonging to previous equipment releases/versions (e.g. for configuration updating) are not here listed but still supported, if compatible with the current one. (For eventual units belonging to previous equipment releases/versions refer to the relevant Technical Handbook).

**N.B.** The Personal Computer (Craft Terminal) utilized for Initial Turn-on and Maintenance operations is not listed as an item of the equipment, but it can be supplied by Alcatel. See Operator’s Handbook for PC hardware configuration.

### 2.1 The equipment view

The 3D rear view of 1642EMC is shown in Figure 22. The front view for –48VDC/-24VDC is shown in Figure 23., and the front view for 220VAC/230VAC is shown in Figure 24. (taking one E1RCB8 board that are inserted with service board as examples).
Figure 22. 3D rear view of 1642EMC equipment

Figure 23. 3D front view of 1642EMC equipment (DC48V/24V)

Figure 24. 3D front view of 1642EMC equipment (AC220/230V)
### 2.2 Equipment parts list

In the following tables are listed all the items of the equipment. Such tables report the following information:

- **ITEM DESCRIPTION**: Name of part
- **ITEM CODE**: ASB factory Part Nos. (Such as 411.xxx.xxx x) of item
- **MODULE**: Name of the module in item
- **CODE**: ASB factory Part number of module
- **QTY**: Quantity
- **Max QTY**: Maximum quantity

#### Table 12: Unit part list

<p>| COMMON PART | RSA-1U MAIN UNIT 48V 75OHM | RSA-ASSEM 48(1U) 75OHM 3AL97256AA** | 1 | 1 | RSA-ASSEM 48(1U) 75OHM MA-1U COVER 3AL97257AA** | 1 | RSA-ASSEM 48(1U) 75OHM IC<em>FEPROM</em>SDCFBI-64 1AB147830003 | 1 | RSA-ASSEM 48(1U) 75OHM LABEL, POLYESTER, ADHESIVE 1AD005740048 | 1 |
| RSA-1U MAIN UNIT 24V 75OHM | RSA-ASSEM 24(1U) 75OHM 3AL97256AB** | 1 | 1 | RSA-ASSEM 24(1U) 75OHM MA-1U COVER 3AL97257AA** | 1 | RSA-ASSEM 24(1U) 75OHM IC<em>FEPROM</em>SDCFBI-64 1AB147830003 | 1 | RSA-ASSEM 24(1U) 75OHM LABEL, POLYESTER, ADHESIVE 1AD005740048 | 1 |
| RSA-1U MAIN UNIT 220V 75OHM | RSA-ASSEM 220(1U) 75OHM 3AL97256AC** | 1 | 1 | RSA-ASSEM 220(1U) 75OHM MA-1U COVER-AC220 3AL97257AB** | 1 | RSA-ASSEM 220(1U) 75OHM IC<em>FEPROM</em>SDCFBI-64 1AB147830003 | 1 | RSA-ASSEM 220(1U) 75OHM LABEL, POLYESTER, ADHESIVE 1AD005740048 | 1 |
| RSA-1U MAIN UNIT 48V 120OHM | RSA-ASSEM 48(1U) 120OHM 3AL97256BB** | 1 | 1 | RSA-ASSEM 48(1U) 120OHM MA-1U COVER 3AL97257AA** | 1 | RSA-ASSEM 48(1U) 120OHM IC<em>FEPROM</em>SDCFBI-64 1AB147830003 | 1 | RSA-ASSEM 48(1U) 120OHM LABEL, POLYESTER, ADHESIVE 1AD005740048 | 1 |
| RSA-1U MAIN UNIT 24V 120OHM | RSA-ASSEM 24(1U) MA-1U BOX DC48 3AL97256AA** | 1 | RSA-ASSEM 24(1U) MA-1U COVER AC220 3AL97257AA** | 1 | RSA-ASSEM 24(1U) IC<em>FEPROM</em>SDCFBI-64 1AB147830003 | 1 | RSA-ASSEM 24(1U) LABEL, POLYESTER, ADHESIVE 1AD005740048 | 1 | RSA-ASSEM 48(1U) 75OHM MA-1U BOX DC48 3AL97235AA** | 1 | RSA-ASSEM 48(1U) PBA-1U MB 75 3AL97226BB** | 1 | RSA-ASSEM 48(1U) PBA-1U PBP48 3AL97231AA** | 1 |</p>
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### Table 13. Accessories part list

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<tr>
<td>DCP-1642EMC 1.1 CD-ROM EN</td>
<td>3AL97473AA**</td>
<td></td>
</tr>
</tbody>
</table>

### Table 14. Explanatory notes

<table>
<thead>
<tr>
<th>Note</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This is the main box without OE 155Mbit/s interface module, can work in S1.1/L1.1/L1.2 optical interface mode and in SC or LC fiber connector (electrical interface can not supported on main box). TM or ADM mode by the choice of optional OE module independently, refer to PBA-OMS11/OML11/OML12 and PBA-SFPM1.</td>
</tr>
<tr>
<td>2</td>
<td>3AL97086AA** and 3AL97086AB** can meet with ETS 300386 V1.3.1 Class A qualification only.</td>
</tr>
<tr>
<td>3</td>
<td>The double shield DC48V power cable is dedicated for ETS 300386 V1.3.1 Class B qualification.</td>
</tr>
</tbody>
</table>
SFPM1 module is the 155Mbit/s optical interface module without SFP OE transceiver, can work in S1.1/L1.1/L1.2 optical interface use LC fiber connector depend on the different SFP transceiver’s choice of user. It can support on main box but can’t use on OT1B1 board.

2.3 Connection layout

There are only one slot in the 1642EMC equipment. As indicated in Figure25. it is service board slot, in which different types of service boards can be inserted such as E1RCB8, OT1B1, E3B1, ES1 8FE, LES1 3FE ...

![Figure25. The slot layout of the 1642EMC equipment rack](image)
2.4 Units panel view

Figure 26. to Figure 41. are the panel view and descriptions of all units of 1642EMC equipment.

2.4.1 1U MB front panel (DC48V power supply)

Note:
(1) Housekeeping port
(2) Debug port
(3) F port
(4) Q port
(5) ALM indicator
(6) OTA work status indicator
(7) OTB work status indicator
(8) OTA module: ‘RXA’ is receiver port; ‘TXA’ is transmitter port.
(9) OTB module: ‘RXB’ is receiver port; ‘TXB’ is transmitter port.
(10) DC power supply interface, D 3-terminal connector: ‘GND’ is anode, ‘-48V’ is cathode, ‘〨’ is protective ground.
(11) 2M external clock output port
(12) 2M external clock input port
(13) Reset button
(14) 1-7 channel 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(15) 8-14 channel 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(16) DC power supply interface, D 3-terminal connector. ‘GND’ is anode, ‘-48V’ is cathode, ‘〨’ is protective ground. Between (10) and (16), one can be chosen as main supply, the other as back supply.
(17) Power supply switch: ‘ON’ means the power supply switch is in the connected status. ‘OFF’ means the power supply switch is in the disconnected status.
(18) Service slot which can be plugged into other kinds of service board.

Figure 26. 1U MB front panel (DC48V power supply)
2.4.2 1U MB front panel (DC24V power supply)

Note:
(1) Housekeeping port
(2) Debug port
(3) F port
(4) Q port
(5) ALM indicator
(6) OTA work status indicator
(7) OTB work status indicator
(8) OTA module: ‘RXA’ is receiver port; ‘TXA’ is transmitter port.
(9) OTB module: ‘RXB’ is receiver port; ‘TXB’ is transmitter port.
(10) DC power supply interface, D 3-terminal connector: ‘GND’ is anode, ‘-24V’ is cathode, ‘<’ is protective ground.
(11) 2M external clock output port
(12) 2M external clock input port
(13) Reset button
(14) 1-7 channel 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(15) 8-14 channel 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(16) DC power supply interface, D 3-terminal connector. ‘GND’ is anode, ‘-24V’ is cathode, ‘<’ is protective ground. Between (10) and (16), one can be chose as main supply, the other as back supply.
(17) Power supply switch: ‘ON’ means the power supply switch is in the connected status. ‘OFF’ means the power supply switch is in the disconnected status.
(18) Service slot which can be plugged into other kinds of service board.

Figure 27. 1U MB front panel (DC24V power supply)
2.4.3 1U MB front panel (AC220V power supply)

Note:
(1) Housekeeping port
(2) Debug port
(3) F port
(4) Q port
(5) ALM indicator
(6) OTA work status indicator
(7) OTB work status indicator
(8) OTA module: ‘RXA’ is receiver port; ‘TXA’ is transmitter port.
(9) OTB module: ‘RXB’ is receiver port; ‘TXB’ is transmitter port.
(10) 5A Fuse.
(11) 2M external clock output port
(12) 2M external clock input port
(13) Reset button
(14) 1-7 channel 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(15) 8-14 channel 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(16) AC power supply interface.
(17) Power supply switch: ‘ON’ means the power supply switch is in the connected status. ‘OFF’ means the power supply switch is in the disconnected status.
(18) Service slot which can be plugged into other kinds of service board.

Figure 28. 1U MB front panel (AC220V power supply)
2.4.4 OT1B1 155Mb/s optical interface board

![Diagram of OT1B1 board]

**Note:**

1. Tricolor LED:
   - Green LED ON-units in operation
   - Red LED ON-severity alarm
   - Yellow LED ON-common alarm

2. (3) RJ11 connector: Transparent channel F1 byte, E2 byte.

3. (4), (5) SC/PC optical fiber connector: RX, TX.

Figure29. OT1B1 board, panel view
2.4.5 DE1B28/SDE1B28 E1 interface board

Note:
(1) Tricolor LED:
   - Green LED ON: units in operation
   - Red LED ON: severity alarm
   - Yellow LED ON: common alarm

(2) 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.

Figure 30. DE1B28/SDE1B28 board, panel view
2.4.6 DE1B8/SDE1B8 E1 interface board

Note:
(1) Tricolor LED:
   Green LED ON-units in operation
   Red LED ON-severity alarm
   Yellow LED-common alarm

(2) 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.

Figure 31. DE1B8/SDE1B8 board, panel view
2.4.7 E1B28/SE1B28 E1 interface board

Note:
(1) Tricolor LED:
- Green LED ON-units in operation
- Red LED ON-severity alarm
- Yellow LED-common alarm

(2) 2M service interface: The upper is the transmitting terminal and the lower is the receiving terminal.

Figure 32. E1B28/SE1B28 board, panel view
2.4.8 E1B8/SE1B8 E1 interface board

Note:
(1) Tricolor LED:
   - Green LED ON-units in operation
   - Red LED ON-severity alarm
   - Yellow LED-common alarm

(2) 2M service interface: The upper is the transmitting terminal and the lower is the receiving terminal.

Figure 33. E1B8/SE1B8 board, panel view
2.4.9 DE1B32 E1 interface board

Note:
(1) Tricolor LED:
Green LED ON-units in operation
Red LED ON-severity alarm
Yellow LED ON-common alarm

(2) 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.

Figure 34. DE1B32 board, panel view
2.4.10 E1RCB8 E1 interface board

Note:
(1) Tricolor LED:
   Green LED ON-units in operation
   Red LED ON-severity alarm
   Yellow LED-common alarm

(2) 2M service interface. The upper is the transmitting terminal and the lower is the receiving terminal.
(3) 2M extended service interface for transmitting ECC signals. TX stands for transmitting terminal and RX stands for receiving terminal.

Figure 35. E1RCB8 board, panel view
2.4.11 DS3B1 interface board

Note:
(1) Tricolor LED
   Green LED ON-units in operation
   Red LED ON-severity alarm
   Yellow LED-common alarm

(2), (3) 75 Ω coaxial cable interface: TX, RX.

Figure 36. DS3B1 board, panel view
2.4.12 DS3B1 interface board

Note:
1. Tricolor LED:
   - Green LED ON-units in operation
   - Red LED ON-severity alarm
   - Yellow LED-common alarm

2), (3) 75Ω coaxial cable interface: TX, RX.

Figure 37. E3B1 board, panel view
2.4.13 ISA-ES1 8FE Ethernet interface board (8 port)

Note:
(1) Tricolor LED:
- Green LED ON - units in operation
- Red LED ON - severity alarm
- Yellow LED ON - common alarm

(2)-(9) RJ45 connector: Ethernet port 1-8.

(10) Ethernet interface LINK/ACTIVE status indicating lamp:
- ON means LINK status;
- Flash means ACTIVE status.

(11) Ethernet interface 10M/100M rate indicating lamp:
- OFF means 10M rate
- ON means 100M rate

Figure 38. ISA-ES1 8FE board, panel view
2.4.14 ISA-ES1 3FE Ethernet interface board (3 port)

Note:

(1) Tricolor LED:
   Green LED ON-units in operation
   Red LED ON-severity alarm
   Yellow LED ON-common alarm

(2) SFP optical connector: Ethernet port 1.

(3)(4) RJ45 connector: Ethernet port 2~3.

(5) Ethernet interface LINK/ACTIVE status indicating lamp:
   - ON means LINK status;
   - Flash means ACTIVE status.

(6) Ethernet interface 10M/100M rate indicating lamp:
   - OFF means 10M rate
   - ON means 100M rate

Figure 39. ISA-ES1 3FE board, panel view
2.4.15 ISA-LES1 3FE Ethernet interface board (3 port)

Note:

(1) Tricolor LED:
   - Green LED ON: units in operation
   - Red LED ON: severity alarm
   - Yellow LED ON: common alarm

(2) SFP optical connector: Ethernet port 1.

(3)(4) RJ45 connector: Ethernet port 2~3.

(5) Ethernet interface LINK/ACTIVE status indicating lamp:
   - ON means LINK status;
   - Flash means ACTIVE status.

(6) Ethernet interface 10M/100M rate indicating lamp:
   - OFF means 10M rate
   - ON means 100M rate

Figure 40. ISA-LES1 3FE board, panel view
2.4.16 DE1JB8 E1 interface board

Note:
(1) Tricolor LED:
  Green LED ON-units in operation
  Red LED ON-severity alarm
  Yellow LED-common alarm

(2) 2M service interface.

Figure 41. DE1JB8 board, panel view
3 Functional description

3.1 General description

The functional block diagram of 1642EMC is shown in Figure 42. The main board mainly completes the control function, cross connection function, clock selection function and other auxiliary functions of the whole equipment. The control section integrates EC and SC function to control and manage the whole 1642EMC system. The clock section provides the system clock with three operation modes: tracking synchronization mode, synchronization holding mode and free run mode, ensuring high quality of the equipment clock and providing the network with the best synchronization performance. The cross connection section provides two kinds of matrix: HPC matrix and LPC matrix. The HPC matrix supports 4x4 VC4 cross connection. The LPC matrix provides $252 \times 252$ TU-12 space division cross connection and/or time slot interchange, and complete the flexible operation of E1. The cross connection section provides VC4 bus at four directions, among which two buses are connected to the two STM-1 interfaces and one for E1 interface on the main board, the rest are connected to the back board and sent to the service slot, as shown in Figure 43. Different service boards can be connected into the service slot, including E1 interface board, Ethernet interface board, E3 interface board, DS3 interface board and STM-1 (optical or electrical) interface board.

![Figure 42. The functional block diagram of 1642EMC system](image-url)

The main unit, modules and service boards are listed below.

**Main unit on the main control board:**
- **ECSC UNIT**
  - CPU control part of 1642EMC system, the unit using Motorola bus mode controls all the service slots and other units on the main board. Which also provides F, Q3 and DEBUG interface for communicating. One FPGA comprise of the following units: matrix, clock and expand control units.
- **Matrix UNIT**
The matrix unit provides HPC and LPC cross connection. The HPC matrix supports 4X4 VC4 cross connection. The LPC matrix provides 252 × 252 TU-12 space division cross connection and/or time slot interchange, which provides VC4 bus at four directions.

- **CLOCK UNIT**
  The unit provides the system a clock, with three operation modes: tracking synchronization mode, synchronization holding mode and free run mode, ensuring high quality of the equipment clock and providing the network with the best synchronization performance.

- **EXPAND CONTROL UNIT**
  The unit provides the accessibility to the other chips in the board and supervision for fan and housekeeping signals.

- **HOLOCER UNIT**
  The unit provides the high order overhead process function.

- **E1 MAPPING UNIT**
  The unit provides up to 14 channels E1 mapping funtion and also the 15th channel internally for DCC signal mapping into TU12 payload.

- **OM1 interface module**
  It provides optical or electrical STM-1 interface, using different optical or electrical modules. The various optical interfaces can be S1.1, L1.1 and L1.2 for different transfer distance, and can be SC or LC for different fiber connector. A maximum of two OM1 (or SFPM1) interface modules can be inserted into the main board.

The service board OT1B1 inserted with different OM1 modules can also provide different optical or electrical STM-1 interfaces

**Modules on the main control board:**

- **OM1 interface module**
  The various optical interfaces can be S1.1, L1.1 and L1.2 for different transfer distance, and can be SC or LC for different fiber connector. A maximum of two OM1 optical interface modules can be inserted into the main board. The service board OT1B1 inserted with different OM1 modules can also provide different optical interfaces.

- **SFPM1 interface module**
  It provides STM-1 SFP interface, a maximum of two SFPM1 modules can be inserted into the main board.

**Service boards of the equipment:**

- **E1RCB8**
  8-channel E1 (2.048 Mb/s) coaxial interface (75Ohm), with 2M clock re-timing function

- **E1B8**
  8-channel E1 (2.048 Mb/s) 2mm pin interface (75Ohm) with protection of lightening strike

- **E1B28**
  28-channel E1 (2.048 Mb/s) 2mm pin interface (75Ohm) with protection of lightening strike

- **SE1B8**
  8-channel E1 (2.048 Mb/s) 2mm pin interface (75Ohm), 2M interface.

- **SE1B28**
  28-channel E1 (2.048 Mb/s) 2mm pin interface (75Ohm), 2M interface.

- **DE1B8**
  8-channel E1 (2.048 Mb/s) 2mm pin interface (120Ohm) with protection of lightening strike

- **DE1B28**
  28-channel E1 (2.048 Mb/s) 2mm pin interface (120Ohm) with protection of lightening strike

- **SDE1B8**
  8-channel E1 (2.048 Mb/s) 2mm pin interface (120Ohm), 2M interface.

- **SDE1B28**
  28-channel E1 (2.048 Mb/s) 2mm pin interface (120Ohm), 2M interface.

- **DE1JB8**
  8-channel E1 (2.048 Mb/s) RJ45 interface (120Ohm), 2M interface.
- E3B1
  1-port E3 (34Mb/s) interface
- DS3B1
  1-port DS3 (45Mb/s) interface
- ISA-ES1 8FE
  8-port 10M/100M Ethernet electrical interface
- ISA-ES1 3FE
  3-port 10M/100M Ethernet interface, 1 optical interface and 2 electrical interface
- ISA-LES1 3FE
  3-port 10M/100M Ethernet interface, 1 optical interface and 2 electrical interface
- OT1B1
  1 STM-1 optical interface, OT1M1 module must be inserted and different optical modules provide different optical interfaces.

Other functional boards:
- PBP48
  The power supply-board mainly completes the conversion function from -48V power supply to 3.3V and 5V, with power supply protection function, which also provides back plane connection between main board and service board. The board can also work under -60V power system.
- PBP24
  The power supply-board mainly completes the conversion function from -24V power supply to 3.3V and 5V, with power supply protection function, which also provides back plane connection between main board and service board.
- PBP AC 220
  The power supply-board mainly completes the conversion from 220V/230V AC power supply to 3.3V and 5V, with power supply protection function, which also provides back plane connection between main board and service board.

The system can be divided into the following subsystems according to the functions completed by the equipment:
- Service interface subsystem
- Protection subsystem
- Sub-network connection protection
- MSP subsystem
- Timing subsystem
- Control subsystem
  Mainly complete two functions: EC-equipment control and SC-rack control
- Network management interface
- Auxiliary path and DCC subsystem
  Mainly completed by the overhead processing part and auxiliary access part.
- Power supply subsystem
- Remote inventory subsystem
  Each single board has this function

The functions of the above subsystems are described in the following parts of this chapter.
3.2 Service interface subsystem

Figure 43 shows the block diagram of the service interface subsystem. It is mainly based on the service interfaces provided in the equipment to describe the functional modules for the mapping, de-mapping, multiplexing, de-multiplexing and processing of overhead byte during the process from these service interfaces to SDH frame structure. Figure 43 shows the SDH multiplexing and mapping structure used in this equipment.

Modules in Figure 43:
- O/E, E/O: photo-electric or electric optical conversion unit. It is mainly completed by optical/electric conversion module. In electrical interface mode, this module is replaced by electrical transceiver module.
- OH Processor: overhead processor. It is used to complete the extraction and insertion of regenerator section and multiplex section bytes in the SDH frame structure and processing of POH higher order paths, such as extraction and insertion of E1, E2, F1, D1-D3, and D4-D12. It also completes the extraction of line clock and alarm processing.
- TUPP: tributary unit payload processor. It adjusts the phase relations between the higher order input signals and the higher order output signals through processing low order tributary units (TU3 and TU12), so that the pseudo-synchronous relations of the higher order payload SPE can be compensated in terms of receiving and transmitting rate. The tributary unit processor de-complexes the received STM-1 signals and reinserts the de-multiplexed low order tributary signals into the new STM-1 frame for output. There is no AU pointer adjustment in the output STM-1 frame so that the locations of the tributary signals are completely fixed to the frame head for easy cross connection processing of the tributary signals. For the cross connection at higher order VC level (VC4), TUPP should be bypassed.
- Matrix: cross-connected unit. It completes the cross functions of VC-4 at 4 directions, such as the cross of $252 \times 252$ TU12 or $4 \times 4$ VC4. It also supports time slot interchange when performing TU12 or TU3 cross connection.
- E1 Mapping: asynchronous mapping unit. It completes the mapping and de-mapping process from 2.048Mbit/s signal to TU-12, while complete the multiplexing and de-multiplexing function of the signals from VC4 to TUG3, TUG2 and TUG12. The add bus and the drop bus use independent timing module, complete multi-frame alignment using H4 byte test mode and provide far end loop-back and near end loop-back functions for testing and failure identifying.
- Retiming or Bypass: retiming unit. E1RCB8 board possesses retiming function and performs retiming processing for the 2M signals. Other 2M boards adopt bypass mode.
- 2MLIU: Line interface unit. The differential interface of the receiving part has very high noise tolerance. It first completes equalized amplification for the data signals arriving at the G.703 physical interface, resumes the clock, tests the LOS alarm and transmits line code HDB3 to the mapping chip after decoding. The transmitting part first completes coding of HDB3 after the signal is de-mapped, shapes the signal according to G.703 standards after the jitter is attenuated, drives the line and then transmit to the external lines.
- VC4 Bus retiming: VC4 bus sequence adjuster. As difference exists between the SDH Telecom bus interfaces of EOS mapping unit and the bus interface of the system in terms of sequence, VC4 bus sequence adjuster adjusts the sequence to make the interfaces matched.
- EOS Mapping: EOS (Ethernet Over SDH) mapping unit.
The unit uses GFP/LAPS protocol to achieve the mapping and de-mapping of the Ethernet signal and SDH payload. The mapping bandwidth can be flexibly configured into one to five VC12s or one to three VC3s and can operate in the mode of point-to-point or ring network. It uses large capacity SDRAM of 16M as the buffer of the Ethernet frame. The 100M full duplex interface at the Ethernet side uses MII interface, while the SDH side uses standard 19M Telecom bus interface.

- **Ethernet Switch & Interface**: Ethernet switch and interface unit
  Ethernet interface and the terminal equipment adapt or adjust to the best operation mode (support 10M or 100M rate, full-duplex or semi-duplex modes) and can display the link and rate status of each port through the LED on the panel. The Ethernet switch chip supports 7 ports 100M block-free switch function.

- **E3/DS3 Mapping**: 34M/45M mapping unit
  It completes the asynchronous mapping and the reverse de-mapping from E3 signal to VC3. The signal from the line interface unit is first mapped to VC3, and then aligned in TU3, then multiplexed to TUG3 and finally multiplexed to V4 signals and sent to the back panel through TELECOM BUS. Likewise, the VC4 signals sent from the back panel complete the reverse de-multiplexing and de-mapping process and the de-mapped signals are sent to the line interface unit. The mapping unit also provides the functions of performance counting, alarm test and loop-back.

- **34M/45M LIU**: 34M/45M line interface unit
  The inputted signal is amplified and equalized; the LOS alarm is tested; the clock and data are resumed and the HDB3 code of the line signal is decoded and sent to the mapping unit. The line interface unit, at the transmitting direction, first completes the coding of the de-mapped signals sent from the mapping unit according to the format of HDB3 code and then completes the pulse shaping of the coded signals, and finally transmits the signals complying with standard template to the lines.

---

**Figure 43. Block diagram of service interface subsystem**

- **A direction**
  - E1 Mapping
  - Buffer
  - VC4 Bus re-timing
  - E3/DS3 Mapping
  - 34M/45M LIU
  - Transformer
  - 8 port 10/100M Ethernet
  - 1 port 34M/40M

- **B direction**
  - Matrix
  - TUP
  - ON Processor
  - 2M LIU
  - Transformer
  - O/E E/O

---

**Figure 43. Block diagram of service interface subsystem**
Figure 44. 1642EMC SDH multiplexing and mapping structure
3.3 Timing subsystem

3.3.1 Performance requirement of SDH transmission equipment clock

Please refer to the technical requirements of SDH equipment -- clock in G.813 of the ITU-T recommendations for the performance requirement of SDH transmission equipment clock.

3.3.2 Functional requirements of SDH transmission system for timing transmission

Establishing a digital synchronous network based on SDH transmission network must make use of STM-N line/tributary signals as the timing link for timing transmission. The transmission timing functional requirements of SDH transmission system are the requirements for the clock functional structure of SDH transmission system.

The functional structure of SDH equipment clock meets the regulations in G.783 of ITU-T recommendations, as shown in Figure45. In the figure, T1 is the STM-N input interface, i.e. signals from STM-N line/tributary unit; T2 is the PDH input interface, i.e. signals from PDH tributary unit; T3 is the external synchronous input interface, i.e. the reference signals from externally connected timing input; SETG is the synchronous equipment timing generator, i.e. the SEC of SDH equipment clock; T4 is the external synchronous output interface and its timing output can be directly exported from STM-N line/tributary unit and can also complete the internal timing interface from SETG T0.

The selectors in the structure of SDH equipment clock possess the following functions

1. Selector A
   - Selector A has the function of priority setting and block/open setting for all the STM-N line/tributary signals.
   - Selector A has the function of sequencing according to the SSM quality level and preset priority of all the selected input signals.

2. Selector B
Selector B has the function of priority setting and block/open setting for all the STM-N line/tributary signals.
Selector B has the function of priority setting and block/open setting for at least one path of PDH tributary signals.
Selector B has the functions of priority setting, SSM quality level identification, SSM quality level presetting and block/open setting for all external synchronous input signals.
Selector B has the functions of sequencing according to the SSM quality level and the preset priority of all the selected input signals.

(3) Selector C
Selector C has the function of direct export from STM-N line/tributary signal or bypassing SETG output.
Selector C has the function of setting SSM threshold.
Selector C has the function of inserting AIS data or blocking in T4 timing output signal according to the set SSM threshold for 2Mb/s interface.
When the T4 timing output signal selects to export from STM-N line/tributary unit and when LOS/AIS/LOF alarms appear in the selected STM-N line/tributary signals, Selector C has the function of inserting AIS data or blocking in T4 timing output signal for 2Mb/s interface.

(4) The priority sequence of the timing reference signal from top to bottom is
Manual forced order, such as forced holding or forced switching
Timing signal failure such as LOS AIS or LOF.
SSM quality level
Preset priority

(5) Requirements of the external synchronous interface and physical interface of SDH equipment.
Quantity and types of interfaces
Install one external synchronous input interface and one external synchronous output interface and the interface type is 2048 Kbit/s.
The physical/electric properties meet the requirements of G.703 in ITU-T recommendations. The frame structure of 2048 Kbit/s meet to the stipulations in G.704 of ITU-T recommendations.
That is to say, in the 2048 Kbit/s multi-frame structure, the 4th, 5th, 6th, 7th and 8th bits of TS0 time slot with odd number indicate SSM data.

2048 Kbit/s external synchronous input interface
It has the functions of identifying SSM quality level or AIS data identification or SSM quality level presetting.

2048 Kbit/s external synchronous output interface
It has the function of transmitting SSM quality level or transmitting AIS data or blocking its output according to the SSM quality level of SDH multiplex section layer.

(6) Reference signal failure processing
Once the server layer detects defect of reference signal, it immediately activates the synchronous source signal failure. And in order to allow correct processing under the quality level QL (Quality Level) closing mode, the non-selected synchronous signals should also has the ability of signal failure activation processing.

Hold-off time
The hold-off time ensures that the transient activation of the signal failure is not processed through the selection.

Wait to restore time
The wait to restore time ensures that the previous failed synchronous signal, after processed through selection, will be reconfirmed as effective only after a certain period of time in which no failure occurs.
3.3.3 The SSM functional requirements of SDH transmission equipment

The SSM functional requirements of SDH transmission equipment mainly involve three aspects: the definition of SSM quality level, SSM response principle and SSM response time delay.

(1) Definition of SSM quality level

It is specified in G.707 of the ITU-T recommendations that the 5-8 bits of multiplex section S1 byte in STM-N frame structure are used to indicate SSM quality level and the definition is given in Table 15.

<table>
<thead>
<tr>
<th>SSM coding</th>
<th>Priority sequence</th>
<th>Description of quality level</th>
<th>The corresponding Chinese clock levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>0010</td>
<td>Max.</td>
<td>QL_PRC</td>
<td>Level 1 reference clock</td>
</tr>
<tr>
<td>0000</td>
<td></td>
<td>QL_UNK (optional)</td>
<td>Quality level unknown</td>
</tr>
<tr>
<td>0100</td>
<td></td>
<td>QL_SSUT</td>
<td>Level 2 node clock</td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td>QL_SSUL</td>
<td>Level 3 node clock</td>
</tr>
<tr>
<td>1011</td>
<td></td>
<td>QL_SEC</td>
<td>SDH network element equipment clock</td>
</tr>
<tr>
<td>1111</td>
<td>Min.</td>
<td>QL_DNU</td>
<td>Synchronous signal unavailable</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>Pre-reserved</td>
</tr>
</tbody>
</table>

(2) SSM response principle

➢ The principle for re-transmitting SSM quality level in the holding status

When SEC loses the input timing reference signal and no other timing reference signals are available, SEC will enter the holding status, the STM-N lines/tributary units in all directions and the external timing output signal (except those directly exported) should transmit the SSM data of SEC clock level.

➢ The principle for re-transmitting SSM in the non-switching status

When the SSM quality level of the timing reference signal selected by SEC changes and does not cause reference switching, the STM-N lines/tributary units in all directions (except those transmitting DNU in reverse direction) and the external timing output signal (except those directly exported) should transmit the varied SSM quality level data.

➢ Regulations for re-transmitting SSM in the switching status

When SEC selects new timing reference signal, the STM-N lines/tributary units in all directions (except those transmitting in reverse direction) and the external timing output signal (except those directly exported) should transmit the SSM quality level data of re-selected timing reference signal.

➢ Principles for reverse transmission

When SEC selects a STM-N line/tributary unit as the timing reference signal, its corresponding reverse STM-N line/tributary unit should transmit the SSM quality level data of QL_DNU. When the external timing output signal selects to be exported through STM-N line/tributary unit and SEC selects the external timing input signal as the timing reference signal, its corresponding reverse STM-N line/tributary unit should transmit the SSM quality level data of QL_DNU.

➢ Principles for direct export of external timing output signal

When the external timing output signal selects to be exported through STM-N line/tributary unit, it should transmit the SSM quality level data of the STM-N line/tributary unit selected. When LOS/AIS/LOF alarms appear in the selected STM-N line/tributary signal, the 2Mbit/s interface has the function of inserting AIS data in external timing output signal or blocking.
3.3.4 Retiming principle of PDH 2Mb/s tributary

In the local transmission network layer, when SDH transmission system is unable to extend and needs to use PDH 2Mbit/s tributary unit for timing transmission, its PDH 2Mbit/s service must be retimed to avoid the effect on the timing quality caused by SDH pointer adjustment.

- Basic principle for retiming
  Basic principle for PDH 2Mbit/s service retiming dropped from SDH transmission system is shown in Figure46.

Note: the retiming function can be one function of the SDH network element and it can also be an independent entity. When the retiming function is an independent entity, its timing signal can come from the synchronous supply unit within the exchange.

Figure46. Schematic diagram of PDH 2Mbit/s tributary retiming

- Retiming requirements
  (1) SDH network element retiming functional module should provide retiming buffer storage for the retiming of 2Mb/s service. The capacity of the buffer storage should be at least 125us (1 frame) + 18us (slide control lag).
  (2) SDH network element should be able to accumulate the slide times generated in the retiming buffer storage to serve as relevant performance monitor data.

3.4 Cross connection subsystem

3.4.1 General

The cross-connection subsystem is the functional center of 1642EMC optical transmission equipment, has powerful time division cross connection function, support the cross connection of low order and high order path, with flexible configuration feature.
The cross connection subsystem of 1642EMC has $4 \times 4$ equivalent VC-4 time division cross connection matrix at the level of VC-12, VC-3 and VC-4. It can achieve functions such as time slot assignment, protection switching and port loop-back between aggregate and aggregate, aggregate and tributary unit. This enables 1642EMC optical transmission system to have powerful networking capacity and to support point-to-point, link, ring and other more complicated network topology structure. When working with SNCP protection switching subsystem, the cross connection subsystem has powerful sub-network connection protection function, ensuring the reliability of the transmission network. The cross capacity is as shown in Table 16.

### Table 16. Cross capacity table

<table>
<thead>
<tr>
<th>Capacity</th>
<th>4X4 equivalent VC-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>VC12, VC3, VC4</td>
</tr>
<tr>
<td>Mode</td>
<td>aggregate and aggregate, tributary unit and aggregate</td>
</tr>
</tbody>
</table>

#### 3.4.2 Cross connection function

The view of the cross connection subsystem is shown in Figure 47. The cross connection subsystem achieves the low order and high order path cross connection between the 4 slots of 1642EMC optical transmission equipment. Slot 0 and Slot 1 are the slots for STM-1 optical / electrical module and Slot 2 can be used to insert E1 interface board, E3/DS3 interface board, fast Ethernet interface board and STM-1 optical / electrical interface board. Slot 3 is fixed for 14 channels of E1 interface. Tributary interface and aggregate interface have the same cross connection; i.e. cross connection can achieve multiple cross connection functions such as through connection, add-drop, broadcasting, time slot cross and loop-back.
Through: The through mode refers to one aggregate input cross connection matrix that does not involve in add and drop tributary services but directly output from another aggregate interface. In this case, the equipment plays the role of a relay, as shown in Figure 48.

![Figure 48. Through mode](image)

Add-drop: The add-drop mode refers to drop services from the aggregate to the tributary unit or add the services from the tributary unit to the aggregate according to the configured time slot. The add and drop service time slots are any of the applicable time slots on the aggregate and can be different, as shown in Figure 49.

![Figure 49. Add-drop mode](image)

Broadcasting: The broadcasting mode refers to drop the same service from the aggregate to more than two tributary unit, or the same tributary unit service is added in more than two aggregate time slots, and it can also be configuring the same service between the aggregates to multiple time slots as well as combined application of these modes, as shown in Figure 50.
Figure 50. Broadcasting mode

Time slot cross: the time slot cross mode refers to time slot cross configuration of low order services between aggregates, between aggregates and tributary units. The time slot cross of the aggregate and the tributary unit is shown in Figure 51.

Figure 51. Time slot cross mode

Loop-back: the loop-back mode means that the services on the aggregate or the tributary unit are output from the same time slot after entering the cross connection matrix. There are two modes: aggregate loop-back and tributary unit loop-back, as shown in Figure 52.

Figure 52. Loop-back mode
3.4.3 Cross connection configuration

The cross connection configuration information required by the 1642EMC cross connection subsystem is provided by the SNCP protection switching subsystem. According to specific protocol, the SNCP protection switching subsystem transmits the cross connection configuration information table to the cross connection subsystem and the cross connection configuration information table has three modes: VC12, VC3 and VC4, as shown in Table17.

Table17. Cross connection configuration information table

### VC12 mode

<table>
<thead>
<tr>
<th>SN of time slot configuration</th>
<th>SN of cross output time slot</th>
<th>SN of cross input time slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No.1 VC12 of No.0 VC-4</td>
<td>No. X VC12 of No. X VC-4</td>
</tr>
<tr>
<td>2</td>
<td>No.2 VC12 of No.0 VC-4</td>
<td>No. X VC12 of No. X VC-4</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>63</td>
<td>No.63 VC12 of No.0 VC-4</td>
<td>No. X VC12 of No. X VC-4</td>
</tr>
<tr>
<td>64</td>
<td>No.1 VC12 of No.1 VC-4</td>
<td>No. X VC12 of No. X VC-4</td>
</tr>
<tr>
<td>65</td>
<td>No.2 VC12 of No.1 VC-4</td>
<td>No. X VC12 of No. X VC-4</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

### VC3 mode

<table>
<thead>
<tr>
<th>SN of time slot configuration</th>
<th>SN of cross output time slot</th>
<th>SN of cross input time slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No.1 VC3 of No.0 VC-4</td>
<td>No. X VC3 of No. X VC-4</td>
</tr>
<tr>
<td>2</td>
<td>No.2 VC3 of No.0 VC-4</td>
<td>No. X VC3 of No. X VC-4</td>
</tr>
<tr>
<td>3</td>
<td>No.3 VC3 of No.0 VC-4</td>
<td>No. X VC3 of No. X VC-4</td>
</tr>
<tr>
<td>4</td>
<td>No.1 VC3 of No.1 VC-4</td>
<td>No. X VC3 of No. X VC-4</td>
</tr>
<tr>
<td>5</td>
<td>No.2 VC3 of No.1 VC-4</td>
<td>No. X VC3 of No. X VC-4</td>
</tr>
<tr>
<td>6</td>
<td>No.3 VC3 of No.1 VC-4</td>
<td>No. X VC3 of No. X VC-4</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

### VC4 mode

<table>
<thead>
<tr>
<th>SN of time slot configuration</th>
<th>SN of cross output time slot</th>
<th>SN of cross input time slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No.0 VC-4</td>
<td>No. X VC-4</td>
</tr>
<tr>
<td>2</td>
<td>No.1 VC-4</td>
<td>No. X VC-4</td>
</tr>
<tr>
<td>3</td>
<td>No.2 VC-4</td>
<td>No. X VC-4</td>
</tr>
</tbody>
</table>

3.5 SNCP Protection switching subsystem

3.5.1 General

The SNCP protection switching subsystem achieves the protection switching function of the services. It processes the service operating status according to service configuration information, service protection information and alarm monitor information. It refreshes the cross connection configuration information table and transmits it to the cross connection subsystem, thus achieving the configuration and protection switching of the services.

The protection switching subsystem is shown in Figure53. and it is divided into 4 modules: the configuration interface, alarm monitor interface, protection switching status processor, cross connection configuration information interface.
3.5.2 Configuration interface

The network management writes the service configuration information and the protection configuration information into the SNCP protection switching subsystem through the configuration interface. The configuration information include:

- Operating time slot number
- Main time slot number
- Standby time slot number
- Forced primary enabled
- Forced standby enabled
- Standby time slot effective enabled
- Restore switching enabled
- The switching restores time with 10 seconds as the multiple.

The restore switching means that when a failure occurs in the primary time slot and the operating time slot is switched from the primary time slot to the standby, and then, if the failure of the primary time slot is removed, after the wait to restore switching time (generally 5 minutes), the operating time slot is switched back to the primary time slot. However, in non-restore switching mode, the operating time slot is not switched back to the primary time slot when the failure of the primary time slot is removed.

3.5.3 Alarm monitor interface

Alarm monitor interface monitors the alarm of the time slots in a real time manner, and if alarms such as MS-AIS, AU-AIS, AU-LOP, TU-AIS, TU-LOP, LOM and error code over limit, it will trigger the protection switching processor for switching processing.

3.5.4 Protection switching status processor

Protection switching status processor is the core part of the SNCP protection switching subsystem. It processes the protection switching status according to network management configuration information and
the alarm status, and generates current service time slot table and cross connection configuration information table according to the protection switching status. Meanwhile, it transmits the latest cross connection configuration information table to the cross connection subsystem.

The protection switching time is an important index to measure the protection switching performance and it determines the self-healing and reliability of SDH network operation. For this purpose, 1642EMC optical transmission equipment adopts the proprietary system hardware to achieve processing of protection switching. Compared with the realization mode of conventional protection switching control software, the processing only depends on the response time of the hardware and the time taken for the protection switching is thus greatly reduced. This is very significant to services, such as such as signaling, picture and data, that are sensitive to error code. The typical switching time is much better than the 50ms switching time as required in ITU-T recommendations.

The service protection switching in the protection switching processor is divided into three levels: VC12, VC3 and VC4. For the switching of multiple services at the same level or different level services, the switching time is also much better than the 50ms switching time as required in ITU-T recommendations.

3.5.5 Cross connection configuration information interface

Cross connection configuration information interface performs the function of transmitting the cross connection configuration information table from the protection switching processor to the cross connection subsystem.

There are two transmission modes for the cross connection configuration information table: VC12, VC3 and VC4. Refer to the cross connection configuration of cross connection subsystem section for detailed definition.

3.6 Sub-network connection protection

3.6.1 General

Sub-network connection protection (SNCP) is a fast protection mode suitable for various complex network topology structures.

![Sub-network connection protection diagram](image)

**Figure54. View of sub-network connection protection**

As shown in Figure54, sub-network connection protection (SNCP) uses the 1+1 protection mode. The services are transmitted simultaneously in the operating sub-network and protection sub-network, i.e. the so-called “concurrent” mode. In normal situation, the receiving terminal connected with the sub-network selects the signals transmitted on the operating network. When the connection of operating sub-network fails or the performance is degraded to some threshold value, the receiving terminal connected with the sub-network selects the signals on the protection sub-network according to the principle of “receiving the best”.
3.6.2 The sub-network connection protection of 1642EMC

Due to the powerful overhead processing capacity of 1642EMC system, powerful low order and high order cross capacity of the cross connection subsystem and fast protection switching status processing capacity of the protection switching subsystem, 1642EMC is able to achieve powerful SNCP function (VC12 level, VC3 level and VC4 level).

1642EMC not only meets the ITU-T G.841 recommendations for SNCP, it can also meet the requirement that the switching time for multiple SNCP switching is better than 50ms, even if multiple SNCP switching are generated at the same time or SNCP switching of multiple VC12, VC3 and VC4 combined services.

3.7 MSP subsystem

3.7.1 General

The MS Linear Trail Protection is a 1+1 linear APS (single ended/dual ended) line protection for STM–N synchronous interfaces only. (MSP: Multiplex Section linear trail Protection).

Switching might be caused by line failure or hardware faulty on another system/component connected to the switching one.

The switching device is located after RS and MS terminations of main and spare streams (e.g. at tributary levels).

The switching criteria are: Loss of Signal, Loss of frame, MS–AIS, Excessive BER and, with software setting, Signal Degrade.

This feature permits a 1+1 protection in a linear link, where a path signal is protected by another dedicated path which carries the same signal. The protection can be set both in single and in dual ended mode. In single ended mode the protection is accomplished by switching only the signal affected by the failure. In dual ended mode the protection is accomplished by switching both the affected and the unaffected signals.

The switching signaling is carried over the APS channel (K1 and K2 bytes), using the K–byte protocol.

3.7.2 Linear 1+1 MSP of 1642EMC

1642EMC only supports linear 1+1 single-ended MSP for STM-1. Figure 55 shows an example of linear single ended 1+1 protection, and the case of signal switching after a unidirectional failure on the main link (FERF=Far End Receive Failure, APS=Automatic Protection Switching).

Note: the FERF signal is actually called MS–RDI =Remote Defect Indication.
3.8 Control subsystem

3.8.1 Functional description of control subsystem

The control subsystem of 1642EMC is on the main board. It integrates EC (equipment control) and SC (Shelf control) functions, including MCF (Massage Communication Function), VMMF (Virtual Machine Management Function), PMMF (Physical Machine Management Function) and BPF (Basic Process Function).

The control subsystem provides the hardware resources and software function (protocol stack) needed for the communication between the network element and the management system. The communication is based on F interface (connected with the management termination 1320CT), Q interface (connected with LAN to 1353SH) and QECC interface. The functional block diagram of control subsystem is shown in Figure58.

The control subsystem also provides administration function of SDH, including:
- General function: management time label embedded in the control path
- Failure management: alarm monitor and alarm history management
- Performance monitor: performance monitor event processing, performance data collection, performance monitor history, application of threshold and performance data report.
- Configuration management: control and identification of network elements and data exchange
- Safety management: Registration, password and safety level control

To complete the above functions, the control subsystem is equipped with large-capacity non-volatile storage unit.

There is a DIP switch on Main board that would effect software running. According to different software release the definition of DIP switches are different. Dip switches Pin1-2 (U38) On Main board configuration are shown as Table18 and Table19

N.B. Be sure Pin1-2 (U38) are all “OFF” for normal work!
Table 18. For Release 1.0

<table>
<thead>
<tr>
<th>Pin 1</th>
<th>Pin 2</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>NORMAL</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>NORMAL</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>NORMAL</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Stopped in Rawloader, application can’t work</td>
</tr>
</tbody>
</table>

Table 19. For Release 2.0

<table>
<thead>
<tr>
<th>Pin 1</th>
<th>Pin 2</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>NORMAL</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>Scratch Main DB and LOCAL DB</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Scratch Main DB and LOCAL DB</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Format all the content of CF</td>
</tr>
</tbody>
</table>

3.8.2 The external interface of the control subsystem

- **F interface**
  It performs the local management of the network elements through 1320CT. The interface is on the panel of the main board

- **QECC interface (DCC channel)**
  Each 1642EMC provides 3 DCC channels, on Slots 0. The interface is a communication interface related to TMN. 1642EMC provides two types of QECC interfaces; one uses the embedded communication path overhead byte in SDH frame to transmit through optical signals; the other transmits through the 9th E1 channel on E1RCB8. The first type is able to terminate three full-duplex DCC channels from SDH interface. The rate of DCC_M is 576kbit/s, the rate of DCC_R is 192 kbit/s and the rate of DCC_P is 64 kbit/s. The rate of the second type DCC channel is fixed at 192 kbit/s. There is a special DCC channel in 1642EM/1642EMC which is a DCC_over_E1. The DCC channel can transport in 2M traffic. In 1642EMC, it’s is fixed on the Main board as the 15th E1 channel or on board E1RCB8.

- **HK interface**
  The interface has two groups of parallel input housekeeping signals and two groups of parallel output housekeeping signals for the customers to test the external environment. The interface is on the panel of the main board.

![Housekeeping Input Interface](image)

**Figure 56. Housekeeping input interface**
3.9 Network management interface

Please refer to ITU-T G.784 for general description of network management. The network management of the equipment is achieved through PC. The network management software is 1320CT or 1353SH. As the network management server, PC manages the whole network through 1320CT or 1353SH.

Taking one SDH network element as a gateway, the network management can be connected to all the 1642EMC equipment through Qecc.

Figure 59. shows an example of network management architecture. 1320CT interface is actually a RS-232 (F interface) interface; 1353SH interface is Q interface. It can perform:

- Local management, connected with 1320CT management termination through F interface.
- Local management, connected with 1353SH management termination through Q interface.
- Remote management, it addresses to the physical equipment through SDH equipment or SDH gateway that is directly connected with TNMS1000+ management termination. In this case, the network management information is transmitted through optical fiber using DCC byte (Qecc connected). By this function, the equipment can address and manage the remote SDH network element.

The network management connection and the information transmission inside 1642EMC are shown in Figure 60. The controller transmits information between Qecc, F interface and administrative bus.

The controller uses DCC bus at the STM-1 port to transmit message to other network elements from TMN. Based on the network management configuration, information can be transmitted using D1:D12 or F2 bytes in the STM-1 frame structure. The SDH network element connected on the bus extracts information from
these bytes and transmits it to the internal equipment controller. The selected controller of the network element uses management bus and the units to transmit information (for configuration and status processing). These data will be transmitted to the network management through STM-1 DCC (Qecc) or 15th E1 on MB or E1RCB8 board.

Figure 59. View of network management architecture
3.10 Auxiliary channel and DCC subsystem

SDH provides overhead byte in SOH and POH of the synchronous frame structure. These bits are used to process the functions of byte alignment, parity check, network management, and performance test, etc. Some of them are used for network management (DCC: data communication path), as shown in Figure61.

Network communication bytes (DCC) are D1-D3 (regenerator section) and D4-D12 (multiplex section). The transmission rate of the DCC channel can be configured as 576kbit/s, 192kbit/s or 64kbit/s, mapping respectively into the corresponding frames. One network element can receive DCC in four directions simultaneously. There is a housekeeping interface provide two channel input and two channels output.

External interfaces of the system are:
- One 100M Ethernet interface
- One F interface
- One debug interface
- One housekeeping interface

Figure60. Connection between 1642EMC and network management (through gateway)
*: Slots 0-1 are fixed as optical module and STM-1 signals are transmitted; slot2 can be configed as 155M, 34/45M, 2M, ethernet service board. The DCC3 is a fixed and special DCC channel which has the function of DCC_over_E1.

Figure 61. DCC subsystem

3.11 Power supply subsystem

The power supply of the equipment adopts integrated power supply mode. All the power supplies are converted from DC -24V or DC -48V or AC220V on 1U PBP48/24/220 board) and mainly provide two operating power supplies: +5V and 3.3V. Each single board including the main board, service board and function modules has the DC/DC converter to provide the 1.8V and 2.5V power itself.

In order to ensure stable and uninterrupted power supply of the equipment, the DC power supply adopts primary and standby mode. In case one power supply fails, the other will provide stable power supply, thus power failure will not occur to the system. The switching in this case is completed automatically by the hardware.

The block diagram of the power supply subsystem is shown in Figure 62.
3.12 Remote Inventory subsystem

RI (Remote Inventory) subsystem can enable the operator to obtain the information of any slot or module, including assembly date, number, name of manufacturer, slot type, etc. All the slots and modules have RI function. The relevant data are transmitted through SPI bus. As shown in Figure 63.
4 Units description

4.1 MB main board

The main board performs the system control of 1642EMC equipment. See Figure 64. for the block diagram of the main board.

Main functions and features:

- Two STM-1 optical interfaces with SC or LC connector
- Up to 14 channel E1 interface with 75Ohm or 120Ohm
- Management and control of service signals
- Cross connection of service signals on the channels
  - VC4/TU3/TU12 cross connection
  - TU3/TU12 time slot interchange
- Protection switching of the services
  - MS/VC4 SD alarm and HO POM
  - VC4/VC3/VC12 SNCP
  - Linear 1+1 MSP on STM-1 (single-ended)
- Synchronous function
- SPI bus
- Providing customer interface, status indicating lamp and reset button
- Power supply
- RI remote inventory
STM-1 service interfaces

Two optical modules can be installed on the main board, providing STM-1 optical (SC or LC) interface. The optical module can provide different type of interface: S1.1, L1.1 and L1.2. The optical module can also support automatic laser shutdown function.

E1 service interfaces

The main board offers 14 channels E1 (2Mbit/s) service function, which have external HM interface in the equipment front panel. There is also a special 2Mbit/s channel for DCC3 interface in addition, which is internally connected to SECMINIO block. By this way, the No.3 channel DCC signal can be handled as a common 2Mbit/s service signal, and will not occupy the SDH overhead and transmitted in TU-12 payload transparent. The DCC channels are ordered from 0 to 3.

The management and control of service interfaces

The control part of 1642EMC performs the functions of EC and SC:
- EC functions include:
  - Messaging function: provides the hardware resources and software functions needed for the communication between network elements and network management system (local or remote).
  - Virtual machine management function: event reporting, network management login, database management, software download and other functions.
  - Physical machine management function: configuration and management of SDH functional modules and chips (status monitor, alarm and event collection, performance test), as shown in Figure65.

Figure65. Block diagram of management and control function
The main board provides address decode reassignment, regeneration of sequence and assignment of control signals. The control part on the main board can check the in-place and power-on status of each service board and achieve identification and reset of single boards.

**Cross connection of service signals**

The service signals from/to the four service boards and “HOLOCER” on main board are all connected to the matrix of “SECMINIO” on the main board, which achieves cross connection at VC4, TU3 or TU12 level and provides corresponding system clock and synchronous signals according to different types of service boards, as shown in Figure66. The “SECMINIO” also supports time slot interchange at TU3 or TU12 level.

![Figure66. Functional block diagram of cross connection](image)

**The protection of services**

The system provides two kinds of protection: SNCP and linear MSP. The FPGA “HOLOCER” on the service boards or main board detects the MS SD alarm, VC4 SD alarm and other alarms. It also performs HO POM (ExBER, TIM, UNEQ, SD). The FPGA “SECMINIO” on the main board implements the two protection modes according to the software configuration and the alarms from “HOLOCER”. 1642EMC supports SNCP at VC12, VC3 and VC4 level. For linear MSP, it only supports linear 1+1 unidirectional MSP for STM-1. The switching time for SNCP or linear 1+1 MSP is much better than 50ms, which is compliant to the ITU-T G.841 recommendation.

**The synchronization of the equipment**

The main board can extract clock from the line and generate 77MHz, 19MHz and 2MHz system clocks. The 77MHz clock is used as the main clock by the main board itself. The 19MHz clock is transmitted to the service board/module. The main board also supports 2Mbps external clock output.

**Emulate SPI signal**

The downloading of FPGA on the main board is controlled through the software of PQ/ECSC module and is accessed by the emulate SPI interface.

**External Customer interfaces**

The main board provides interfaces:

- 1-channel 100M Ethernet interface (Q)
- 1-channel F interface (RJ45 connector) at a rate of 384000 (F)
- 2-channel housekeeping input interface and 2-channel housekeeping output interface
- 1-channel 2Mbit/s reference clock input and 1-channel 2Mbit/s reference clock output
- Supports 2-channel STM-1 optical interface
- Up to 14 channel E1 interface

The main board provides a reset command key to achieve reset of the system. The key is on the main board panel and the status indicating lamp is also located on the main board panel and controlled by SC.
The status of the main board panel LED

- **ALM LED**: The GREEN color is on when this NE is in service. The YELLOW color is on when common alarm occurs. The RED color is on when severe alarm occurs.
- **OTA LED**: The red LED is ON in case of low optical power input, otherwise the green LED ON.
- **OTB LED**: The red LED is ON in case of low optical power input, otherwise the green LED ON.

3.3V power supply is taken from the backplane board for the power supply of the main board. 3.3V power supply is provided for the modules and chips on the main board and the DC-DC conversion from 3.3V to 2.5V and 1.5V is completed on the main board for power supply to FPGA.

RI is the storage for keeping MB data and upgrading records. See RI remote inventory subsystem section for details.

### 4.2 OMS11 155Mb/s optical interface module

OMS11 optical interface module performs the processing function for 1-channel STM-1 optical signal. The module can be inserted on the main board (MBN) or on the optical tributary board (OT1B1) as a sub-board.

**Main functions:**
- Opto-electric / electro-optical conversion
- Laser shutdown and restart

The functional block diagram of OMS11 is shown in Figure67. The main functional units include optical interface unit, Laser shutdown and restart and RI data unit.

**Description of the main functional units**

- **Optical interface unit**
  The optical interface unit achieves OE/EO conversion function through a receiving and transmitting combined optical module. The optical signals from optical fiber are converted into electric signals in the receiving direction and then are transmitted to the next level chip for processing. Low optical power alarm signals are transmitted at the same time if the fiber is cut. In the transmitting direction, the electric signals from the upstream chip are converted into optical signals and transmitted to the optical fiber. The optical interface unit meets the S1.1 standard as stipulated in G.957 of ITU-T recommendations.

- **Laser shutdown and restart**
  The module can detect the loss of optical signal (LOS) and report to the mother board, and receive the shutdown signal from mother board to implement the ALS function.

- **RI unit**
  RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.
4.3 OML11 optical interface module

The structure and functions of OML11 module are the same as that of OMS11 module, except for the specifications of the optical interface. The optical interface unit of OML11 module meets L1.1 standard as stipulated in G.957 of ITU-T recommendations.

4.4 OML12 optical interface module

The structure and functions of OML12 module are the same as that of OMS11 module, except for the indexes of the optical interface. The optical interface unit of OML12 module meets L1.2 standard as stipulated in G.957 of ITU-T recommendations.

4.5 SFPM1 optical interface module

SFPM1 optical interface module performs the processing function for 1-channel STM-1 optical signal. SFPM module is a short name of Small Form Factor Pluggable (SFP) Transceiver module. The structure and functions of SFPM1 module are similar with OMS11 module, except that the optical interface module is SFP transceiver which provides standard two-wire I2C serial interface. SFPM1 can support all kinds of STM1 interface including S1.1, L1.1 and L1.2 standards for optical interface by Plug in different SFP transceiver module. SFP transceiver is LC duplex module for serial optical data communications applications. The serial data (I2-SDA) is for serial data transfer. The host uses SDA in conjunction with the serial clock signal (I2-SCL) to mark the start and end of serial protocol activation. The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA. The functional block diagram of OMS11 is shown in Figure68.
4.6 OT1B1 155Mb/s optical interface board

Optical tributary board (OT1B1) is one of the service interface boards of 1642EMC equipment, and can be inserted into the service slots as needed. OT1B1 board and OM1 module together provide complete STM-1 optical signal processing function.

The functional block diagram of OT1B1 board is shown in Figure 69. and the main functional units include optic module, CDR, framer and TUPP, A/D bus control unit and power supply unit.

Description of the main functional units:

- **Optic module**
  The main function of optic module is to provide a standard STM-1 optic interface in the line side, and convert optic signals into 155M serial electrical signals in the system side. That is, the feed in of CDR device. Optic module also process alarm indication signal and execute auto shutdown function.

- **CDR**
  CDR is a complete clock recovery and data retiming integrated circuit for OC-3/STS-3 applications at 155Mbps NRZ. Clock recovery and data retiming is performed by synchronizing the on-chip VCO directly to the incoming data stream. The VCO centre frequency is controlled by the reference clock frequency and the selected divide ratio. On-chip clock generation is performed through the use of a frequency multiplier PLL with a byte rate source as reference.

Figure 68. Functional block diagram of SFPM1 module
- **Framer and TUPP**

The framer and TUPP function are integrated in one high density FPGA.

Framer block implement following functions,
1. RS/MS overhead termination
2. High order overhead termination
3. MS/VC4 SD alarm detection and HO POM
4. High order overhead re-generation
5. RS/MS overhead re-generation

RS/MS overhead termination block terminate RS overhead and MS overhead. In this block, A1 and A2 bytes are searched and used to identify the correct frame start, all the position of overhead and payload bytes are based on these two bytes’ location. E1/F1/E2 are extracted. E1 byte will be forwarded to main board as ordered wire channel. F1 and E2 bytes are extracted directly, they provide two 64K user channels on OT1B1 board. RS-DCC and MS-DCC bytes (D1-D3 or D4-D12) will be extracted and then mapped into DCC bus. This block also compares B1 and B2 bytes with the re-calculated value to check if there is some RS or MS bit errors encountered in the network transportation.

In high order overhead termination block, J1 byte is received and compared with the expected trail value to check the connectivity of high order channel. C2 byte is also received and checked if payload type mismatch event occurs. Similar with RS/MS, B3 byte will be compared with re-calculated value to make sure the hitless transportation in high order channel.

In high order overhead regeneration block, J1 byte is inserted into SDH frame, according to the pre-defined sequence. C2 byte will be set to suitable value based on different frame structure. B3 byte will be inserted according to the result of calculation. Normally the current frame will comprise the B3 byte, which stands for the previous framer’s calculation result.

RS/MS overhead regeneration block mainly process E1/F1/E2/DCC/B1/B2 /A1/A2 bytes. This block is the reversed process of RS/MS overhead termination block. E1 byte is inserted in the correct position in the SDH frame. The value of E1 comes from the main board EOW module, where voice process locates. F1 and E2 bytes are used as user channels. In this block, two 64K user channel data will be received and mapped into framer in the F1 and E2 position. Data from DCC bus will be sent back into frame, locates in D1-D3 or D4-D12. B1 and B2 bytes are calculated according to last frame’s data stream. For frame alignment bytes, A1 and A2 bytes are inserted with 0xF6 and 0x28 value respectively.

TUPP block implements tributary payload re-alignment function. It absorb high order pointer adjustment event with low order pointer adjustment event, the position of TU12 or TU3 is fixed because there is no high order adjustment anymore. So each TU12/TU3 channel are aligned in the output port of TUPP, which is required by low order cross connection matrix. If the high order cross connection is needed, the TUPP block should be bypassed.

- **A/D bus control unit**

A/D bus control unit consists of one CPLD and its main functions include address decoding, access to the chips on OT1B1, simulation of SPI bus, board type capture and alarm collection.

- **Power supply unit**

Power supply unit mainly provides the hot plugging protection function of OT1B1 board and supplies power to OT1B1. The hot plugging protection circuit can support single board hot plugging and single board power supply management. The voltage conversion circuit converts 3.3V system power supply voltage into the operating voltage required by the chips on OT1B1.
4.7 E3B1 interface board

E3B1 interface board is one of the tributary interface boards of 1642EMC equipment, and it can be inserted in any of the 4 service slots as needed. E3B1 interface board provides 1-channel E3 signals of 75 Ohm coaxial cable interface and its main function is to perform the asynchronous mapping of E3 signal and multiplexing to VC4 signals as well as the opposite de-multiplexing and de-mapping process.

The functional block diagram of E3B1 interface board is shown in Figure70. and main functional units include:
- Configuration unit;
- Line interface unit;
- Mapping unit;
- A/D bus control unit;
- Bus drive unit;
- RI data unit
- Power supply unit

Description of the main functional units:

- Configuration unit
  Because of its compatible design, the board can be flexibly configured into E3 board or DS3 board according to customers’ needs. The configuration unit is two four-digit switches. By setting the position of the switch, for example, setting S101-1 of the board as OFF, and the other is ON, the board is set as the operating mode of E3 interface board.

- Line interface unit
  E3 signals are connected to the board through a 75 ohms coaxial cable and then are inputted /outputted to line interface unit (LIU) through a transformer. In the receiving direction, line interface unit amplifies and equalizes the input signal, tests the LOS alarm, restores the clock and data, decodes the HDB3 code of the line signal and transmits to the mapping unit. In the transmitting direction, line interface unit first codes the mapped signal from the mapping unit according to the format of HDB3 code, then performs pulse reshaping of the coded signal, finally transmits the signal that complies with the standard template to the line.

- Mapping unit
  The mapping unit mainly performs the asynchronous mapping from E3 signal to VC3 and the reverse de-mapping function. The signals from the line interface unit are first mapped into VC3, aligned in TU3 through the pointer, then multiplexed to TUG3 and finally multiplexed to VC4 signals and transmitted to the backboard through TELECOM BUS. Likewise, the VC4 signals from the backboard are de-multiplexed and de-mapped reversibly, and the de-mapped signals are transmitted to the line interface unit. The mapping unit also provides performance counting, alarm test and loop-back function.

- A/D bus control unit
  A/D bus control unit consists of one piece CPLD and mainly performs the functions of address decoding, access to mapping chip, SPI bus simulation, lights, capture board type and alarm collection.

- Bus drive unit
  Bus drive unit inputs/outputs all the signals connected to the backboard terminals in the E3B1 board after driving.

- RI unit
  RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.

- Power supply unit
  Power supply unit mainly provides the hot plugging function of E3B1 board. The hot plugging protection circuit can support hot plugging of single board and single board power supply management. As the chips on the board require two power supplies, i.e. 3.3V and 5V, two hot plugging protection circuits operate at the same time.
Figure 70. Functional block diagram of E3B1 board
4.8 DS3B1 interface board

DS3B1 interface board is one of the tributary interface boards of 1642EMC equipment, and it can be inserted in any of the 4 service slots as needed. DS3B1 interface board provides 1-channel DS3 signals of 75 Ohm coaxial cable interface and its main function is to perform the asynchronous mapping of DS3 signal and multiplexing to VC4 signals as well as the opposite de-multiplexing and de-mapping process.

The functional block diagram of DS3B1 board is shown in Figure71. The main functional units include:

- Configuration unit
- Line interface unit
- Mapping unit
- A/D bus control unit
- Bus drive unit
- RI data unit
- Power supply unit

Description of the main functional units:

- **Configuration unit**
  Because of its compatible design, the board can be flexibly configured into E3 board or DS3 board according to customers' needs. The configuration unit is two four-digit switches. By setting the position of the switch, for example, setting S101-4 of the board as OFF and the other is ON, the board is set as the operating mode of DS3 interface board.

- **Line interface unit**
  DS3 signals are connected to the board through a 75 ohms coaxial cable and then are inputted /outputted to line interface unit (LIU) through a transformer. In the receiving direction, line interface unit amplifies and equalizes the input signal, tests the LOS alarm, restores the clock and data, decodes the B3ZS code of the line signal and transmits to the mapping unit. In the transmitting direction, line interface unit first codes the mapped signal from the mapping unit according to the format of B3ZS code, then performs pulse reshaping of the coded signal, finally transmits the signal that complies with the standard template to the line.

- **Mapping unit**
  The mapping unit mainly performs the asynchronous mapping from DS3 signal to VC3 and the reverse de-mapping function. The signals from the line interface unit are first mapped into VC3, aligned in TU3 through the pointer, then multiplexed to TUG3 and finally multiplexed to VC4 signals and transmitted to the backboard through TELECOM BUS. Likewise, the VC4 signals from the backboard are de-multiplexed and de-mapped reversibly, and the de-mapped signals are transmitted to the line interface unit. The mapping unit also provides performance counting, alarm test and loop-back function.

- **A/D bus control unit**
  A/D bus control unit consists of one piece CPLD and mainly performs the functions of address decoding, access to mapping chip, SPI bus simulation, lights, capture board type and alarm collection.

- **Bus drive unit**
  Bus drive unit inputs/outputs all the signals connected to the backboard terminals in the E3B1 board after driving.

- **RI unit**
  RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.

- **Power supply unit**
  Power supply unit mainly provides the hot plugging function of DS3B1 board. The hot plugging protection circuit can support hot plugging of single board and single board power supply management. As the chips on
The board requires two power supplies, i.e. 3.3V and 5V, two hot plugging protection circuits operate at the same time.

Figure 71. Functional block diagram of DS3B1 board
4.9 E1RCB8 board

E1RCB8 board is a 2Mbit/s tributary unit interface board of 8-channel 75ohms coaxial interface provided with 1642EMC optical transmission system. It can be configured in Slots 2, 3, 4 and 5 of 1642EMC optical transmission equipment as needed. The main functions are: 1, providing 8-channel 2M tributary service signal interface to complete the asynchronous mapping from E1 service signal to TU 12; 2, providing 1-channel additional 2M signal interface to transmit DCC network management signals; 3, providing retiming function in the downward direction of the 8-channel 2M tributary service signals; 4, it can extract 2Mbit/s clock as the clock source for the system from 1-channel service signal interface and ECC signal interface.

The functional block diagram of E1RCB8 board is shown in Figure 72. The main functional modules of E1RCB8 board include:

- Line interface unit
- Asynchronous mapping unit
- Bus interface unit
- Retiming unit
- Framing unit
- MCU control unit
- RI data unit

Description of main functional units

- **Line interface unit**
  8-channel 2.048Mbit/s signals is inputted and outputted through 1.0/2.3 75ohms coaxial connector. The differential interface of the receiving part has very high noise tolerance. It first completes equalized amplification for the data signals arriving at the G.703 physical interface, resumes the clock, tests the LOS alarm and transmits line code HDB3 to the mapping chip after decoding. The transmitting part first completes coding of HDB3 after the signal is de-mapped, shapes the signal according to G.703 standards after the jitter is attenuated, drives the Line and then transmit to the external Lines.

- **Asynchronous mapping unit**
  Asynchronous mapping unit completes the mapping and de-mapping from 2.048Mbit/s signal to TU-12. The unit adopts add bus and drop bus independent timing mode, uses H4 byte test mode for multi-frame alignment, and it can provide performance counting and provides far-end loop-back and near-end loop-back functions for test and failure locating.

- **Bus interface unit**
  Bus interface unit mainly provides separation and driving between bus signals of Telecom Bus single board and ensures the integrity and anti-interference capacity of the signals.

- **Retiming unit**
  Retiming unit provides an 8-channel elastic memory at the downward 2.048Mbit/s signals. The de-mapped signals from the mapping unit are written in the elastic memory at the respective clock frequency and then red out through a high quality common frequency clock provided by the cock module. The jitter and drift generated during the process of de-mapping can be effectively absorbed by the elastic memory. It’s important to note that once the retiming function of 2.048Mbit/s signal is used, every piece of equipment within the whole network must adopt the timing mode, and the 2.048Mbit/s signal as the clock source.

- **Framing unit**
  Framing unit can insert or take out DCC signals of 192Kbit/s into or from the 2.048Mbit/s frame signals.

- **MCU control unit**
  MCU control unit provides parallel and serial bus for system CPU access, the chips on the control panel and the download of the FPGA configuration files.

- **RI unit**
  RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.
4.10 E1B28 board

E1B28 series 2M tributary unit board is a 2Mbit/s tributary unit interface board provided with 1642EMC optical transmission system using Head-Male pin interface. E1B28 is a 28-channel 75ohms interface 2M tributary unit board, DE1B28 is a 28-channel 120ohms interface 2M tributary unit board, E1B8 is a 8-channel 75ohms interface 2M tributary unit board and DE1B8 is a 8-channel 120ohms interface 2M tributary unit board. In addition, in some applications with better condition, the expensive lightening prevention devices can be removed for several types of 2M tributary unit boards with low cost and meeting the specifications. They are SE1B28, SDE1B28, SE1B8, SDE1B8 and DE1B32. These boards have similar structures and can be configured in Slots 2, 3, 4 and 5 of 1642EMC optical transmission equipment as needed. Its main functions are to provide 8-channel 2M tributary service interfaces for the system and complete the asynchronous mapping from E1 service signals to TU12. The functional block diagram of E1B28 board is shown in Figure73. and its main functional modules include:

- Line interface unit
- Asynchronous mapping unit
- Bus interface unit
- MCU control unit
- RI data unit

Description of the main functional units:

- Line interface unit

The 2.048Mbit/s signals is inputted and outputted through Head-male pin connector. Different resistance networks are used to realize the impedance matching of the interface depending on different applications of 75 ohms and 120 ohms. The differential interface of the receiving part has very high noise tolerance. It first completes equalized amplification for the data signals arriving at the G.703 physical interface, recover the clock, tests the LOS alarm and transmits line code HDB3 to the mapping chip after decoding. The transmitting part first completes coding of HDB3 after the signal is de-mapped, shapes the signal according to G.703 standards after the jitter is attenuated, drives the Line and then transmit to the external Lines. E1B28 has four Line interface units, each of which can process 8 channels 2.048Mbit/s signals.

Figure72. Functional block diagram of E1RCB8 board
- Asynchronous mapping unit
Asynchronous mapping unit completes the mapping and de-mapping from 2.048Mbit/s signal to TU-12. The unit adopts add bus and drop bus independent timing mode, uses H4 byte test mode for multi-frame alignment, and it can provide performance counting and provides far-end loop-back and near-end loop-back functions for test and failure locating.

- Bus interface unit
Bus interface unit mainly provides separation and driving between bus signals of Telecom Bus single board and ensures the integrity and anti-interference capacity of the signals.

- MCU control unit
MCU control unit provides parallel and serial bus for system CPU access, the chips on the control panel and the download of the FPGA configuration files.

- RI unit
RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.

![Functional block diagram of E1R28 board](image)

**Figure 73. Functional block diagram of E1R28 board**

### 4.11 DE1B28 board
DE1B28 board is an E1 service interface board of 28-channel 120ohms impedance matching and its unit structure is the same as that of E1B28. The only difference is that the interface part uses 120ohms impedance matching resistance.

### 4.12 E1B8 board
E1B8 board is an E1 service interface board of 8-channel 75ohms impedance matching and its unit structure is the same as that of E1B28, but it only provides a group (i.e. 8-channel E1) of Line interface unit.
4.13 **DE1B8 board**

DE1B8 board is an E1 service interface board of 8-channel 120ohms impedance matching and its unit structure is the same as that of DE1B28. The board only provides a group (i.e. 8-channel E1) of Line interface unit.

4.14 **SE1B28 board**

SE1B28 board is an E1 service interface board of 28-channel 75ohms impedance matching and its unit structure is the same as that of E1B28. However, the expensive lightening prevention device has been removed and it is an E1 service interface board with low cost while still meeting the specifications.

4.15 **SE1B8 board**

SE1B8 board is an E1 service interface board of 8-channel 75ohms impedance matching and its unit structure is the same as that of E1B28. However, the expensive device of lightening strike prevention has been removed and it is an E1 service interface board with low cost while still meeting the specifications.

4.16 **SDE1B28 board**

SDE1B28 board is an E1 service interface board of 28-channel 120 ohms impedance matching and its unit structure is the same as that of DE1B28. However, the expensive device of lightening strike prevention has been removed and it is an E1 service interface board with low cost while still meeting the specifications.

4.17 **SDE1B8 board**

SDE1B8 board is an E1 service interface board of 28-channel 120 ohms impedance matching and its unit structure is the same as that of DE1B8. However, the expensive device of lightening strike prevention has been removed and it is an E1 service interface board with low cost while still meeting the specifications.

4.18 **DE1JB8 board**

DE1JB8 board is an E1 service interface board of 8-channel 120ohms impedance matching and its unit structure is the same as that of DE1B28. The board only provides a group (i.e. 8-channel E1) of Line interface unit. DE1JB8 board likes DE1B8, but uses different interface.

4.19 **DE1B32 board**

DE1B32 board is an E1 service interface board of 32-channel 120 ohms impedance matching and its unit structure is the same as that of ED1B28. However, the expensive device of lightening strike prevention has been removed and it is an E1 service interface board with low cost while still meeting the specifications.

4.20 **ISA-ES1 8FE Ethernet interface board (8 port)**

The 8 Port Enhanced Fast Ethernet Board (ISA-ES1 8FE) is one of the service boards in 1642EMC -- the compact STM-1 ADM equipment. It’s designed in order to support the Ethernet access, switch and transmission over the SDH system directly. Figure74. shows the constitution of ISA-ES1 8FE board:
Main Features:
- Supports up to eight 10/100Mbit/s Ethernet Port local
- Supports up to eight channels of Ethernet over SDH (ISA-ES1 8FE)
- Supports multi ISA-ES1 8FE protocol: GFP/LAPS/LAPF/PPP
- Supports programmable bandwidth: 1–63 VC12 or 1–3 VC3 or 1 VC4
- Support Virtual Concatenation for SONET/SDH, compensating for up to 48 ms of differential delay
- Support Link Capacity Adjustment Scheme (LCAS) to allow the size of the virtual concatenation groups to be changed dynamically with hitless switching.
- Supports Q3 and SNMP Management
- MAC based forwarding and autolearning
- VLAN based forwarding
- 802.1Q VLAN add/remove/swap
- Stacked VLAN (802.1Q format) add/remove/swap
- Multicast/Broadcast
- 802.1Q Priority bits management for queuing, WFQ scheduling
- Policing and bandwidth allocation

Operating principle:
The hardware architecture of ISA-ES1 8FE is shown as Figure 75. There are two main kind of streams: Service data and Management data. One is the Ethernet service data flow indicated with blue-dot-dash-line. The Ethernet data access to RJ45 connector on panel, into 8*FE PHY & interface, connect to Ethernet switch (PLB2800E) by SSMII interface, then connect with EOS mapping (TXC04236) use SMII interface for Ethernet signal en/decapsulating with GFP/LAPS protocol and mapping into SDH payload use virtual concatenation with LCAS, final use 19M Telecom Add/Drop Bus connect with system bus via the back plane driver. The other is the management data flow composed by PQ2 control flow shown in red-dot-line and PQecsc control flow shown in green-dash-line, Corresponding to the SNMP and Q3 management domain. It is special for TXC04236 that be managed both by PQ2 and PQecsc at same time through MARBITER, which work as a motorola bus arbiter.

Description of the main functional units:
- Ethernet switch and interface unit
  Ethernet switch and interface unit mainly consists of the 8-port RJ45 connectors the integrated Ethernet status indicating lamp and Ethernet transformer, Ethernet PHY and Ethernet switch chips. The Ethernet interface and the terminal equipment adaptively coordinated to the optimal operating mode (support 10M or 100M rate, full duplex or half-duplex mode), and the LED on the panel can indicate the link and rate status of each port. The Ethernet switch chip can support 16-port 100M non-block switch.
- EOS mapping unit
EOS mapping unit implement the Ethernet frame to be encapsulate and decapsulate using GFP/LAPS/LAPF/PPP protocol and the encapsulated frame to be mapping to or demapping from the SDH payload. In general, it provides functionality for mapping and demapping of Ethernet frames to and from SDH virtual concatenated tributary structures. The EOS mapping unit provide complete high and low order path overhead generation and processing for the SDH containers. On the SDH side, the EtherMap-3 provides an STM-1 structure using a single Telecom bus operating at 19.44 MHz. On the Ethernet line side, the EtherMap-3 provides up to eight 10/100 Mbit/s Ethernet ports, each support the industry standard SMII interface. The bandwidth of SDH containers using virtual concatenation, are allowed to increase or decrease in a hitless fashion through the use of an integrated link capacity adjustment scheme (LCAS).

- **Network management block**
  ISA-ES1 8FE board is managed by SC/EC use Q3 and SNMP model respectively. In OND SW and management architecture, the Q3/SNMP boundary is between Virtual Concatenation and GFP, so the Mapper—TXC04226 has to be managed via SNMP for L2 (GFP/LAPS) termination, and Q3 for SDH termination and Virtual concatenation, at the same time.
  For Q3 Management: Mapper configured by EC/SC via 16bit Data/Addr bus arbiter in Eserber, Purple minimal managed by EC/SC via IIC bus (only for debug).
  For SNMP Management: Purple configured by PQ2 via PCI AD bus, Mapper configured by PQ2 via Motorola 16bit Data/Addr bus arbiter in Eserber.
  It use DCC instead of ISSB for code download and update, and Use DCC as SNMP channel, and only Slot2 and Slot3 is available for DCC channel without mainboard update.

![Functional block diagram of ISA-ES1 8FE board](image-url)
4.21 ISA-ES1 3FE Ethernet interface board (3 port)

ISA-ES1 3FE is similar with ISA-ES1 8FE board on principle and implementation, but only provide three Ethernet access ports local, one is 100Mbit/s SFP optical port and two others are 10/100M electronic ports.

Main Features:
- Supports one 100Mbit/s full duplex SFP optical Port
- Supports two 10/100Mbit/s Ethernet electronic Port
- Supports two channels of Ethernet over SDH (ISA-ES1 3FE)
- Supports multi EOS protocol: GFP/LAPS
- Supports programmable bandwidth: 1~63 VC12 or 1~3 VC3 or 1 VC4
- Support Virtual Concatenation for SONET/SDH, compensating for up to 48 ms of differential delay
- Support Link Capacity Adjustment Scheme (LCAS) to allow the size of the virtual concatenation groups to be changed dynamically with hitless switching.
- Supports Q3 and SNMP Management
- Support ETS
- MAC based forwarding and autolearning
- MAC address table up to 8K
- VLAN based forwarding
- 802.1Q VLAN add/remove/swap
- Stacked VLAN (802.1Q format) add/remove/swap
- Multicast/Broadcast
- 802.3x flow control
- 802.1Q Priority bits management for queuing, WFQ scheduling
- Policing and bandwidth allocation

Operating principle:
The hardware architecture of ISA-ES1 3FE is shown as Figure76. Same with ISA-ES1 8FE.

Description of the main functional units:
- Ethernet switch and interface unit
  Ethernet switch and interface unit mainly consists of 2-port RJ45 connectors the integrated Ethernet status indicating lamp and Ethernet transformer, SFP optical module, Ethernet PHY and Ethernet switch chips. The Ethernet interface and the terminal equipment adaptively coordinated to the optimal operating mode (support 10M or 100M rate, full duplex or half-duplex mode), and the LED on the panel can indicate the link and rate status of each port. The Ethernet switch chip can support 5-port 100M non-block switch.
- EOS mapping unit
  Same with ISA-ES1 8FE but only provide 2 Ethernet over SDH (EOS) channels.
- Network management block
  Same with ISA-ES1 8FE.
4.22 ISA-LES1 3FE Ethernet interface board (3 port)

ISA-LES1 3FE is similar with ISA-ES1 3FE board on principle and features, but low cost with different implementation. It provides three Ethernet access ports: one is 100Mbit/s SFP optical port and two others are 10/100M electronic ports.

Main Features:

- Supports one 100Mbit/s full duplex SFP optical Port
- Supports two 10/100Mbit/s Ethernet electronic Port
- Supports two channels of Ethernet over SDH (ISA-ES1 3FE)
- Supports multi EOS protocol: GFP/LAPS
- Supports programmable bandwidth: 1~63 VC12 or 1~3 VC3
- Support Virtual Concatenation for SONET/SDH, compensating for up to 48 ms of differential delay
- Support Link Capacity Adjustment Scheme (LCAS) to allow the size of the virtual concatenation groups to be changed dynamically with hitless switching.
- Support ETS
- MAC based forwarding and autolearning
- MAC address table up to 4K
- VLAN based forwarding
- 802.1Q VLAN add/remove/swap
- Stacked VLAN (802.1Q format) add/remove/swap
- Multicast/Broadcast
- 802.3x flow control
- 802.1Q Priority bits management for queuing, WFQ scheduling
- Policing and bandwidth allocation
- Supports Q3 and SNMP Management
Operating principle:
The hardware architecture of ISA-LES1 3FE is shown as Figure 77. The Ethernet data access by RJ45 connector and SFP interface on panel, into 8*FE PHY & interface, then connect to SMIltrix (CPLD) with SMII interface. SMIltrix is used for SMII interface switch to determine the working mode and SMII ⇔ MII convert function to connect with Z150409 use MII interface. Ethernet packets from PHY can connect to TXC04246 directly or connect to ZL50409 then to TXC04246, controlled by SMIltrix mode control signal. EOS mapping (TXC04246) use SMII interface for Ethernet signal en/decapsulating with GFP/LAPS protocol and mapping into SDH payload use virtual concatenation with LCAS, final use 19M Telecom Add/Drop Bus connect with system bus via the back plane driver. It can work point to point in R1.1 as a transparent EOS board, and then as a switch-able EOS board in R1.2, controled by working mode selection.

Description of the main functional units:

- Ethernet switch and interface unit
  Ethernet switch and interface unit mainly consists of 2-port RJ45 connectors the integrated Ethernet status indicating lamp and Ethernet transformer, SFP optical module, Ethernet PHY and Ethernet switch chips. The Ethernet interface and the terminal equipment adaptively coordinated to the optimal operating mode (support 10M or 100M rate, full duplex or half-duplex mode), and the LED on the panel can indicate the link and rate status of each port. The Ethernet switch chip can support 5-port 100M non-block switch.

- EOS mapping unit
  EOS mapping unit implement the Ethernet frame to be encapsulate and dencapsulate using GFP/LAPS/LAPF protocol and the encapsulated frame to be mapping to or demapping from the SDH payload. In general, it provides functionality for mapping and demapping of Ethernet frames to and from SDH virtual concatenated tributary structures. The EOS mapping unit provide complete high and low order path overhead generation and processing for the SDH containers. On the SDH side, the EtherMap-3 provides an STM-1 structure using a single Telecom bus operating at 19.44 MHz. On the Ethernet line side, the EtherMap-3 provides up to eight 10/100 Mbit/s Ethernet ports, each support the industry standard SMII interface. The bandwidth of SDH containers using virtual concatenation, are allowed to increase or decrease in a hitless fashion through the use of an integrated link capacity adjustment scheme (LCAS).

- Network management block
  ISA-ES1 8FE board is managed by SC/EC use Q3 and SNMP model respectively. In OND SW and management architecture, the Q3/SNMP boundary is between Virtual Concatenation and GFP, so the Mapper—TXC04226 has to be managed via SNMP for L2 (GFP/LAPS) termination, and Q3 for SDH termination and Virtual concatenation, at the same time.

Q3 and SNMP Management all configured by EC/SC via 16bit Data/Addr bus arbiter in Eserber and DCC is not in use. All management interface is provide by Alexbus, a CPLD implement 16 bit data bus extend, control TXC04246, ZL50409, EOS (FPGA) and ALS function for FE optical interface.
4.23 1U PBP220 power supply board

The functions of 1U PBP220 in 1642EMC equipment are to provide DC power supply for the whole system in case of AC power supply; the input part contains the EMI filtering element and the power supply can meet the EMC requirement. It also has the protection function of input under-voltage and output over-current. When applied, the board should be inserted and fixed in front of the frame.

Main functions:
- It provides protection function for input under-voltage and when the input voltage is drop than the set value, instantaneous shut down is actuated.
- It provides the protection function for output over-current. When the output current is greater than the set value, instantaneous shut down is actuated to avoid the damage to power supply and the whole system.
- EMI filter is used to improve the signal quality of power supply.

Operating principle:
The functional block diagram of 1U PBP220 AC power supply interface board is shown in Figure78.

1U PBP220 power supply is connected through the power supply socket on the front plate. After being processed by EMI filter and primary rectification and filtering, and being processed by the voltage transforming module and secondary rectification and filtering module, provides the whole system with 3.3V and 5V power supply.
Description of the main functional units:

- **EMI filtering and rectifier module**
  EMI filter aims to control the interference signal and noise signal in the power supply signal to ensure the quality of the output power supply signal and reduce the electromagnetic interference to the power supply network and the equipment. Primary rectifier rectifies the AC current of the power supply network to DC current.

- **Voltage transforming module**
  The function of voltage transforming module is to change the high voltage DC current from the primary rectification and filtering module into low voltage AC current and it also has the function of primary and secondary separation.

- **Secondary rectification and filtering module**
  The main function of the module is to rectify the low voltage AC current from the voltage-transforming module into 3.3V and 5V DC current and filter it smoothly.

- **Feedback module**
  The module monitors the output voltage and provides the voltage transforming module with feedback signals to improve the stability and the accuracy of the output voltage.

---

**Figure 78. Functional block diagram of 1U PBP220 AC power supply interface board**

---

4.24 1U PBP48 power supply board

Under –48V power system, the single board in 1642EMC equipment provides the whole system with 3.3V and 5V power supply and is located on the front of the equipment.

The board can also work under -60V power system.

**Main functions:**
- Converts from –48V power supply to 3.3V power supply.
- Converts from 3.3V to 5V power supply.
- -48V input power backup.
- Alarm indicating function of the equipment.
- The intrinsic data of the board can be obtained through the network management system.

**Basic operating principle:**
The functional block diagram is shown in Figure 79. The -48V power supply signal is transmitted into PBP48 board through a connector and outputs 3.3V and 5V to the whole system.

**Description of the main functional units:**

- **-48V to 3.3V power supply conversion module**
  The function of the module is to convert the input -48V voltage into 3.3V voltage output needed for system operation. In order to improve the 3.3V power supply signal after the voltage conversion, the module provides input/output filtering function.

- **3.3V to 5V power supply conversion module**
  The function of the part circuit is to convert the output 3.3V voltage into 5V voltage output needed for system operation. In order to improve the 5V power supply signal after the voltage conversion, the circuit of this block provides input/output filtering function.

- **-48V input power backup**
  In order to ensure the stability of the system operation, PBP48 board provides 1+1 backup for the input power backup, i.e. to provide two -48V power line dc/dc converter to avoid that if one -48V power line fails, the board is unable to supply power to the system, resulting in system failure.

- **Alarm indication of power supply input**
  Totally it can support two DC power supplies. If either power supply failed, the power alarm will be indicated to the main board for network management. But it can not distinguish which power supply failed.

- **RI unit**
  RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.

![Functional block diagram of PBP48 power supply panel](image)

**4.25 1U PBP24 power supply board**

Under –24V power system, the single board in 1642EMC equipment provides the whole system with 3.3V and 5V power supply and is located on the front of the equipment.

**Main functions:**

- Converts from -24V power supply to 3.3V power supply.
- Converts from 3.3V power supply to 5V power supply.
- -24V input power backup.
- Alarm indicating function of the equipment.
- The intrinsic data of the board can be obtained through the network management system.
Basic operating principle:
The functional block diagram is shown in Figure 80. The -24V power supply signal is transmitted into PBP24 board through a connector and outputs 3.3V and 5V to the whole system.

Description of the main functional units:
- -24V to 3.3V power supply conversion module
  The function of the module is to convert the input -24V voltage into 3.3V voltage output needed for system operation. In order to improve the 3.3V power supply signal after the voltage conversion, the module provides input/output filtering function.

- 3.3V to 5V power supply conversion module
  The function of the module is to convert the output 3.3V voltage into 5V voltage output needed for system operation. In order to improve the 5V power supply signal after the voltage conversion, the module provides input/output filtering function.

- -24V input power backup
  In order to ensure the stability of the system operation, PBP24 board provides 1+1 backup for the input power backup, i.e. to provide two -24V power line dc/dc converter to avoid that if one -24V power line fails, the board is unable to supply power to the system, resulting in system failure.

- Alarm indication of power supply input
  Totally it can support two DC power supplies. If either power supply failed, the power alarm will be indicated to the main board for network management. But it can not distinguish which power supply failed.

- RI unit
  RI unit contains an EEPROM, which records some basic information about this board, such as versions of hardware and software, EPGA, and CPLD version information. See Section 4.1.11 for detailed description.

Figure 80. Functional block diagram of PBP24 power supply panel
5 Technical specifications

5.1 General specifications

- General specifications
  - Optical interface: 155.52Mbit/s (optical or electrical interface)
  - Electric tributary bite rate: 2048kbit/s, 34368kbit/s, 44736kbit/s
  - Ethernet: 10Base-T, 100 Base-T
  - Span length: Depending on optical fiber type and optical power.
  - Application types: Terminal multiplexer, ADM, small DXC, networks with or without protection: link, ring and mesh.

- Applied standard (ITU-T)
  - Electric interface: G.703, V.11, RS-232
  - EOW interface: G.711, G.713, Q.23
  - SDH frame, multi-frame structure: G.707
  - Equipment function: G.782, G.783, G.784
  - Optical interface: G.957, G.958
  - Optical fiber: G.652, G.653, G.654
  - Transmission quality: G.784, G.821, G.826
  - System management function (software): X.733, X.734, X.736, G.704, G.774
  - Jitter and wander: G.783, G.823, G.825
  - Synchronization: G.811, G.813
  - Network protection: G.841, G.842
  - Optical amplification: G.662, G.663, G.823, G.825

- Applied standard (CE)
  - EMC/EMI: ETSI EN300386 Class B** (note)
  - Environment: ETSI EN300019
  - Safety: IEC 60950

- Add-drop services and cross connection capacity
  - Cross connection capacity: 252X252 TU12
  - Cross connection function: Tributary-to-tributary time slot assignment, Loopback, Broadcasting, Drop or through, Sub-network connection protection.
  - Transmission delay: 125us

- Protection
  - Network protection: Sub-network connection protection at VC12 level (SNCP/I)

- Management interface
  - Local interface: F interface RJ45 RS-232, 38kbit/s.
  - Remote interface: F interface RJ45 RS-232, 38kbit/s or DCC path through optical transmission (D4-D12 or D1-D3)
  - Management mode: Remote communication management network (TMN) Qecc, through DCC byte.
  - Protocol stack /massage model: Refer to ITU-TG.774 and ETSI, ISO-OSI7 layer reference model.
- Operations processes

Configuration

Equipment, port, add-drop paths, cross connection, synchronization, protection, MCF, SEMF and overhead connection can be completed locally or remotely.

Software download

Local or remote file download can be performed without interrupting the services but when download is completed and the program is refreshed, a short time service interruption may occur.

Performance monitoring

Refer to G.784, G.826 and G.821.

Unit and equipment

The following data can be obtained through RI: company ID, unit type, unit number, unit serial number, etc. See the operation handbook for details.

Security

Password, operation files, Backup of data and programs.

- Sub-functions of the units

Service board

No effect on other service

Main board

Traffic interruption

Optical or electric module

Traffic interruption

See Figure 56.

- Input housekeeping signals

The input voltage range in closed condition

-12VDC (±30%) *  

The maximum guarantees current in the closed condition Ic

3mA

* To enable Housekeeping Input alarm, the interface should be in closed condition with external voltage input needed. This external voltage input is isolated from internal equipment power supply. It should be DC12V between HK Input + (higher voltage) and HK Input – (lower voltage).

See Figure 57.

- Output housekeeping signals (Relay)

The maximum guarantees current in the closed condition

50mA *

The maximum allowed voltage with open condition

-70V

* To enable Housekeeping Output alarm, the interface should be in closed condition with output closed circuit created.

- Clock characteristics

Selectable input reference timing

Extracts 2048kbit/s from 2Mbit/s; extracts from STM-1 port.

Nr. of selected reference clocks (normal mode)

Up to 4

Synchronization output

2048 Kbit/s G. 703 (75Ohm impedance)

Operational modes

Locked reference source

Free-run mode ± 4.6 ppm

Holding mode, drift 0.37 ppm/day

Synchronization selection

Priority and SSM algorithm.

N.B. 1642EMC product all meet with ETS 300386 V1.3.1 Class B qualification (Other than Telecommunication Center) except the PartNumber list following:

- 3AL97086AA** (E3B1 board) meet with ETS 300386 V1.3.1 Class A qualification (Telecommunication Center) only

- 3AL97086AB** (DS3B1 board) meet with ETS 300386 V1.3.1 Class A qualification (Telecommunication Center) only
5.1.1 Optical safety

Refer to Table 20 below for the hazard level classification of different optical interfaces.

Table 20. Hazard level classification of optical interfaces

<table>
<thead>
<tr>
<th>Port/unit</th>
<th>Optical interface type</th>
<th>Hazard level</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM-1</td>
<td>S-1.1</td>
<td>1</td>
</tr>
<tr>
<td>STM-1</td>
<td>L-1.1</td>
<td>3A</td>
</tr>
<tr>
<td>STM-1</td>
<td>L-1.2</td>
<td>3A</td>
</tr>
<tr>
<td>STM-1</td>
<td>L-1.2JE1</td>
<td>3A</td>
</tr>
</tbody>
</table>

- Installation location
It is recommended to install equipment in a “position strictly complying with environment requirements” or a “controlled location”.

- Incorporated laser sources characteristics
Output optical interface parameters: the wavelength and the maximum optical power at the output connector incorporated laser sources are given in the table.

- Labeling
The labels reproduced below are affixed during factory settings, except those placed in a plastic bag and provided with the module. The customer should affix the label on the fiber protection cover of the optical module.

The optical interfaces which have HAZARD LEVEL 3A carry the following hazard symbol label:

![CLASS 1 LASER PRODUCT](image)

The optical interfaces which have HAZARD LEVEL 3A and operate at 2nd window carry the following explanatory label:

![CAUTION LASER RADIATION WHEN OPEN](image)

The optical interfaces which have HAZARD LEVEL 3A and operate at the 3rd window carry the following explanatory label:

![INVISIBLE LASER RADIATION](image)
The label is put on the fiber protection covers of the following ports:

- STM-1 port of L1.2
- STM-1 port of L1.2JE1

The multi-language label kit is placed in the same plastic bag provided together with the optical interface, where the mentioned above explanatory labels are put.

- fiber connectors
  The locations of fiber connectors are reported on topographical drawings of units’ front views and optical interface front views.

- Engineering design features
  In normal operating conditions, unless intentional manumission, the laser radiation is never accessible. The laser beam should be launched in optical fiber through an appropriate connector that totally shuts up the laser radiation. Moreover, a plastic cover is fitted upon optical connectors by means of screws. ALS time must not exceed the maximum value as stipulated in G.958.

- Safety instructions
  The safety instructions for proper assembly, maintenance and safe use including of clear warnings concerning precautions to avoid possible exposure to hazardous laser radiation.

5.1.2 Electric safety

<table>
<thead>
<tr>
<th>Safety state of the connection with other equipment</th>
<th>Connect with <strong>TNV</strong> (telecommunication network voltage): remote alarm, housekeeping and power supply</th>
</tr>
</thead>
</table>

- Labeling
  Labels described in Section 3.2.3.1 are affixed during factory settings.

- Safety instructions
  The safety instructions for proper assembly, maintenance and safe use including of clear warnings concerning precautions to avoid possible exposure to hazardous voltage.

5.2 Main specifications of optical interfaces

Three types of interface types are available for STM-1 optical interfaces of 1642EMC equipment: S1.1, L1.1 and L1.2. The type of the fiber connector is SC/PC. See Table 21 for the main specifications of optical interfaces. The interface types be available for 100Base-LX SFP optical interfaces of ISA-ES1 3FE / LES1 3FE are same with STM-1, but the type of the fiber connector is LC.

**Table 21. STM-1 optical interface parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal bit rate</td>
<td>kbit/s</td>
<td>STM-1 155 520 (ITU-T G.707)</td>
</tr>
<tr>
<td>Application code</td>
<td></td>
<td>S-1.1, L-1.1, L-1.2</td>
</tr>
<tr>
<td>Operating wavelength Range</td>
<td>nm</td>
<td>1261-1360, 1263-1360, 1480-1580</td>
</tr>
<tr>
<td>Transmitter reference point S</td>
<td></td>
<td>MLM, MLM, MLM</td>
</tr>
<tr>
<td>Source type</td>
<td></td>
<td>MLM, MLM, MLM</td>
</tr>
<tr>
<td>Spectrum characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Maximum RMS (σ) spectrum width</td>
<td>nm</td>
<td>7.7, 3, -</td>
</tr>
</tbody>
</table>

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### 5.3 Main specifications of electric interfaces

#### 5.3.1 Characteristics of 2.048Mbit/s electric interface

- **Interface type**: ITU-T G.703 standard electric interface
- **Bit rate**: 2.048Mbit/s ± 50ppm
- **Code**: HDB3
- **Signal magnitude**: 3Vp (120 ohms balanced)
  
  2.37 Vp (75 ohms unbalanced)
- **Attenuation accepted on the incoming signal**: The attenuation frequency characteristic of the incoming line pair follows the approximate law. The attenuation accepted at 1024KHz is 0-6dB. $\sqrt{f}$
- **Echo wave loss**:
  - $\geq 12$dB 51-102kHz;
  - $\geq 18$dB 102-2048kHz
  - $\geq 14$dB 2048-3072kHz
- **Pulse shape**: Complies with template in G.703 of ITU-T recommendations

#### 5.3.2 Characteristics of 34.368Mbit/s electric interface

- **Interface type**: Electric interface, complying with ITU-T recommendations G.703
- **Bit rate**: 34368kb/s ± 20ppm
- **Number of branch**: 1
- **Code**: HDB3
- **Signal magnitude**: 1Vp (75ohms)
- **Attenuation tolerance on the incoming signal**: The attenuation frequency characteristic of the incoming line pair follows the law of approximate. The attenuation accepted at 17.148 KHz is 0-12dB. $\sqrt{f}$
- **Retune loss**:
  - $\geq 12$dB 860-1720kHz
  - $\geq 18$dB 1720-34368kHz
  - $\geq 14$dB 4368-51550kHz
- **Pulse shape**: Complies with the template shown in Fig. 17 of G.703 of ITU-T recommendations
5.3.3 Characteristics of 44.736Mbit/s electric interface

<table>
<thead>
<tr>
<th>Interface type</th>
<th>Electric interface, complying with G.703 of ITU-T recommendations and T1 102 of ANSI recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit rate</td>
<td>44736kb/s ± 20ppm</td>
</tr>
<tr>
<td>Number of tributaries</td>
<td>1</td>
</tr>
<tr>
<td>Code</td>
<td>B3ZS</td>
</tr>
<tr>
<td>Signal magnitude</td>
<td>Complying with G.703 in ITU-T recommendations and T1 102 in ANSI recommendations</td>
</tr>
<tr>
<td>Attenuation tolerance on the incoming signal</td>
<td>Complying with G.703 in ITU-T recommendations and T1 102 in ANSI recommendations</td>
</tr>
<tr>
<td>Pulse shape</td>
<td>Complying with the template shown in Figure 17 of G.703 in ITU-T recommendations and the template shown in Fig. 5 of T1 102 in ANSI recommendations</td>
</tr>
</tbody>
</table>

5.3.4 Characteristics of 155.520Mbit/s electric interface

<table>
<thead>
<tr>
<th>Interface type</th>
<th>Electric interface, complying with G.703 of ITU-T recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit rate</td>
<td>155 520 kbit/s ± 20ppm</td>
</tr>
<tr>
<td>Number of tributaries</td>
<td>1</td>
</tr>
<tr>
<td>Code</td>
<td>CMI</td>
</tr>
<tr>
<td>Signal magnitude</td>
<td>1 ± 0.1 V (Complying with ITU-T G.703)</td>
</tr>
<tr>
<td>Attenuation tolerance on the incoming signal</td>
<td>12.7 dB at a frequency of 78 MHz(Complying with ITU-T G.703).</td>
</tr>
<tr>
<td>Pulse shape</td>
<td>Complying with the template shown in Figure 22,23,24 of G.703 in ITU-T recommendations.</td>
</tr>
</tbody>
</table>

5.3.5 Characteristics of 10/100Base-T Ethernet interface

<table>
<thead>
<tr>
<th>Interface type</th>
<th>Compliant to IEEE-802.3 protocol 10Base-T and 100Base-T interface standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mode</td>
<td>Auto-Negotiation options: 10Mbps or 100Mbps, full duplex or half-duplex mode.</td>
</tr>
<tr>
<td>Transmission rate</td>
<td>Ethernet 10Mbit/s, high speed Ethernet 100Mbit/s.</td>
</tr>
<tr>
<td>Net port cable</td>
<td>Twisted-pair Cat.5 UTP (100M).</td>
</tr>
<tr>
<td>Connector</td>
<td>RJ45</td>
</tr>
</tbody>
</table>

5.3.6 Interface specifications of auxiliary channel

The auxiliary channel interface is mainly used as the transparent path interface provided to customers. It uses E2 and F1 bytes of STM-1 optical interface and each optical interface provides two transparent path interfaces. RS-232 level is used and the transmission rate is 9600 bit/s.

RS-232 interface specifications:

- **Bit rate**: 9600 bit/s.
- **Mode**: RS-232 transmitting and receiving.
- **Level**: 24V (bipolarity)
5.4 Power specifications

The specifications of 1642EMC equipment power supply are given in Table22

Table22. Power supply specifications

<table>
<thead>
<tr>
<th>Power supply board</th>
<th>Nominal voltage</th>
<th>Voltage range</th>
<th>Max. HP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1U MAIN UNIT 48V</td>
<td>-48V DC</td>
<td>-48VDC* (-20%, +50%), about -38.4VDC~72.0VDC</td>
<td>48W</td>
</tr>
<tr>
<td>1U MAIN UNIT 24V</td>
<td>-24V DC</td>
<td>-24VDC* (-20%, +20%), about -19.2VDC~28.8VDC</td>
<td>48W</td>
</tr>
<tr>
<td>1U MAIN UNIT 220V</td>
<td>220V-240V AC</td>
<td>220-240VAC* (-10%, +6%), about 198.0VAC~254.4VAC</td>
<td>54W</td>
</tr>
</tbody>
</table>

5.5 Alarm specifications

Unit alarm:
There is a bicolor LED (red/green) on service board panel in slot.
LED indications:
- Red indicates a major alarm in the unit.
- Yellow indicates a common alarm.
- Green indicates units in service.

Main board alarm:
There are 3 bicolor LEDs on the main board as alarm indicators. Their locations are shown in Figure26.

Where:
(6) and (7) are the alarming LEDs of the two optical modules embedded on the main board.
LED indications:
- In case of low light input, the red LED is ON, otherwise the green LED is ON.

(5) is ALM LED: The GREEN color is on when this NE is in service. The YELLOW color is on when common alarm occurs. The RED color is on when severe alarm occurs.

External environment alarm (housekeeping)
1642EMC provides 2-input and 2-output housekeeping interfaces, where customers can define its use. ENABLED and DISENABLED can be set on the network management interface.
When ENABLED is set on one port, the customer can set the alarm level value (0 or 1) of the input and can inquire the alarm through network management.
When DISENABLED is set on one output port, the output can be controlled as 0 or 1 from the network management interface. If it is 0, the signal for external circuit loop is open; else is short.

Reset button:
There is a reset button on the main board panel. Pressing the button will reset the software.
Warning: Pressing the key will cause service interruption and do not press except in special circumstances.

Debug port:
A debug port is provided on the main board panel of 1642EMC, which can communicate with PC serial interface for equipment debugging.

5.6 Mechanical specifications

Mechanical compatibility: refer to the installation handbook
Overall dimension: 44mm*260mm*440mm
Units dimension: Service board: 165×230mm
Optical module: 42.02mm×45.4mm
Equipment weight: <4Kg
Cooling conditions: There are fan boards on the left side
Electric connection: RJ11
RJ45
IEC 807 (sub-D)
IEC 169-1 (coax. 1.0/2.3) Head-Male 4 × 12

5.7 Environmental conditions

5.7.1 Climatic for operating conditions

The Equipment meets the requirements of ETSI Standards with use of two internal fans. The functionality of the Equipment, Vs. Temperature, is in compliance with:

ETS 300 019–1–3 :1992, class 3.2.

Class 3.2: Partly temperature–controlled locations.
(See climatogram in Figure 81.)

This class applies to locations:
– Where installed equipment may be exposed to solar radiation and heat radiation. They may also be exposed to movements of the surrounding air due to draughts in buildings, e.g. through open windows. They may be subjected to condensed water and to water from sources other than rain and icing. They are not subjected to precipitation:
  – Where mould growth or attacks by animals, except termites, may occur;
  – With normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area and/or with heavy traffic;
  – In close proximity to sources of sand or dust;
  – With vibration of low significance, e.g. for products fastened to light supporting structures subjected to negligible vibrations.

The conditions of this class may be found in:
– Entrances and staircases of buildings;
– Garages;
– Cellars;
– Certain workshops;
– Buildings in factories and industrial process plants;
– Unattended equipment stations;
– Certain telecommunication buildings;
– Ordinary storage rooms for frost resistant products and farm buildings, etc.
5.7.2 Storage

The equipment meets the following requirements Vs. Storage:

ETS 300 019–1–1 : 1992, class 1.2

Class 1.2: weather protected, not temperature controlled storage location. This class applies to weather protected storage having neither temperature nor humidity control. The location may have openings directly to the open air, i.e., it may be only partly weatherproofed. The climatogram is shown in Figure 82.

This class applies to storage locations:
- Where equipment may be exposed to solar radiation and temporarily to heat radiation: They may also be exposed to movements of the surrounding air due to draughts, e.g. through doors, windows or other openings. They may be subjected to condensed water, dripping water and to icing. They may also be subjected to limited wind-driven precipitation including snow;
- Where mould growth or attacks by animals, except termites, may occur;
- With normal levels of contaminants experienced in urban areas with industrial activities Scattered over the whole area, ad/or with heavy traffic;
- In areas with sources of sand or dust, including urban areas;
- With vibration of low significance and insignificant shock.

The conditions of this class may occur in:
- Unattended buildings;
- Some entrances of buildings;
- Some garages and shacks.
5.7.3 Transportation

The equipment meets the following requirements Vs. transportation:

**ETS 300 019–1–2 : 1992, class 2.2**

Class 2.2: Careful transportation. (See Table 23)

This class applies to transportation where special cares has been taken e.g. with respect to low temperature and handling.

Class 2.2 covers the condition of class 2.1. In addition class 2.2 includes transportation in all types of lorries and trailers in areas with well-developed road system.

It also includes transportation by ship and by train specially designed shock-reducing buffers. Manual loading and unloading of to 20 Kg is included.

Extension of extreme low temperature during transportation is permitted for the equipment in its standard packing:

**AT –40°C for 72 Hours maximum**

Without damaging the Optical interfaces.
## Table 23. Transportation climatic conditions

<table>
<thead>
<tr>
<th>Environment condition</th>
<th>Unit</th>
<th>2.1 and 2.2</th>
<th>2.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Low temperature</td>
<td>°C</td>
<td>-25</td>
<td>-40</td>
</tr>
<tr>
<td>(B) High temperature, air in unventilated enclosures</td>
<td>°C</td>
<td>+70</td>
<td>+70</td>
</tr>
<tr>
<td>or outdoor air (NOTE 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(C) High temperature, air in ventilated enclosures</td>
<td>°C</td>
<td>+40</td>
<td>+40</td>
</tr>
<tr>
<td>or outdoor air (NOTE 2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(D) Change of temperature air/air (NOTE 3)</td>
<td>°C</td>
<td>-25 / +30</td>
<td>-40 / +30</td>
</tr>
<tr>
<td>(E) Change of temperature air/water (NOTE 3)</td>
<td>°C</td>
<td>+40 / +5</td>
<td>+40 / +5</td>
</tr>
<tr>
<td>(F) Relative humidity, not combined with rapid temperature changes</td>
<td>%</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>(G) Relative humidity, combined with rapid temperature changes</td>
<td>%</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>(H) Absolute humidity, combined with rapid temperature changes: air/air, at high relative humidity</td>
<td>°C</td>
<td>-25 / +30</td>
<td>-40 / +30</td>
</tr>
<tr>
<td>(I) Low air pressure</td>
<td>KPa</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>(J) Change of air pressure</td>
<td>KPa/min</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>(K) Movement of the surrounding medium, air</td>
<td>m/s</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>(L) Precipitation rain</td>
<td>mm/min</td>
<td>6 (NO1 ≤ 7)</td>
<td>6</td>
</tr>
<tr>
<td>(M) Radiation, solar</td>
<td>W/m²</td>
<td>1120</td>
<td>1120</td>
</tr>
<tr>
<td>(N) Radiation, heat</td>
<td>W/m²</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>(O) Water from sources other than rain (NOTE 5)</td>
<td>m/s</td>
<td>1</td>
<td>(NOTE 7)</td>
</tr>
<tr>
<td>(P) Wetness</td>
<td>none</td>
<td>conditions of wet surfaces</td>
<td></td>
</tr>
</tbody>
</table>

### Notes to Table 23

**NOTE 1:** The high temperature of the surfaces of a product may be influenced by both the surrounding air temperature, given here, and the solar radiation through a window or another opening.

**NOTE 2:** The high temperature of the surface of a product is influenced by the surrounding air temperature, given here, and the solar radiation defined below.

**NOTE 3:** A direct transfer of the product between the two given temperature is presumed.

**NOTE 4:** The product is assumed to be subjected to a rapid decrease of temperature only (no rapid increase). The figures of water content apply to temperatures down to the dew–point; at drop temperatures the relative humidity is assumed to be approximately 100%.

**NOTE 5:** The figure indicates the velocity of water and not the height of water accumulated.

**NOTE 6:** Occurrence of condensation.

**NOTE 7:** For short duration only.
6 MAINTENANCE

ATTENTION

EMC NORMS

WHEN CARRYING OUT THE GIVEN OPERATIONS OBSERVE THE NORMS STATED IN PARA.4.1.3

6.1 General safety rules

SAFETY RULES

Carefully observe the front-panel warning labels prior to working on optical connections while the equipment is in-service.

Should it be necessary to cut off power during the maintenance phase, proceed to switch off the power supply units as well as cut off power station upstream (rack or station distribution frame)

SAFETY RULES

A TNV-2 (battery) voltage could be present on “R/M interface connector” (cable side); do not touch the pins when unplugged.

DANGER: Possibility of personal injury. Short circuiting, low-voltage, low-impedance, dc circuits can cause severe arcing that can result in burns and/or eye damage. Remove rings, watches, and other metal jewelry before working with primary circuits. Exercise caution to avoid shorting power input terminals.

SAFETY RULES

DANGER: Possibility of eyes damage: read carefully and strictly observe the rules pointed out in para.3.2.4.2

6.2 General rules

• Check that the equipment is operating with all the shields properly positioned (dummy covers, ESD connector protections, etc)

• In order to reduce the risk of damage the electrostatic sensitive devices, is mandatory to use the elasticized band (around the wrist) and the coiled cord joined connect with the ground rack during the touching of the equipment

6.3 Maintenance Aspects

Maintenance consists of a set of operations which maintain or bring back the assembly to optimum operating conditions in a very short time, with the aim of obtaining maximum operational availability.
Maintenance is classified as:

- ROUTINE
- CORRECTIVE

6.4 Instruments And Accessories

There is a local terminal (PC) which permits to display all the alarms and manages the Equipment. The relative processing is described in the operator's handbook.

Where TMN is implemented, an Operation System displays alarms and manages all the connected Equipments of the network. Refer to the relevant handbooks.

The need of special tools and accessories to perform possible routine and corrective maintenance procedures is described inside the procedures themselves.

6.5 Routine Maintenance

Routine maintenance is a periodic set of measurements and checks. This maintenance discovers those devices whose function has deteriorated with time and therefore need adjustment or replacement.

Typically, digital equipment requires no routine maintenance.

The equipment allows to assess the quality of the connection links for SECTION and PATH counting the errored events and obtaining performance data.

The Performance Monitoring Application, described in the Operator’s Handbook, allows this function.

6.5.1 Routine maintenance every year

It is suggested to carry out the following operations yearly:

- power cables check

6.5.1.1 Power cables check

**SAFETY RULES**

**DANGER:** Possibility of personal injury. Personal injury can be caused by -48 V dc.

**DANGER:** Possibility of personal injury. Short circuiting, low-voltage, low-impedance, dc circuits can cause severe arcing that can result in burns and/or eye damage. Remove rings, watches, and other metal jewelry before working with primary circuits. Exercise caution to avoid shorting power input terminals.

Make these operations:

- Check that the power cable is perfectly safety grounded.
- Make sure that the subrack has been tightly fastened to the rack with screws, to guarantee grounding (the rack is connected to the station ground).
6.6 Corrective Maintenance (Trouble/Shooting)

Since the Troubleshooting procedure is carried out with the use of the Craft Terminal, please refer, for details, to the Maintenance Section of the Operator’s Handbook.

**FIXING THE UNITS (AND MODULES) INTO THE SUBRACK**

(attention to avoid equipment damage)

The screw tightening torque for fixing the units (and modules, if any and if fixed by screws) into the subrack must be:

\[
2.8 \text{ kg x cm (0.28 Newton x m) } \pm 10 \%
\]

Exceeding this value may result in screw breaking.

6.7 Set of spare parts

6.7.1 Suggested Spare Parts

The overall number of spares depends on Customer requirements, and should be based on the average amount of transmission circuits available to be accounted for not only during MTBF but also during MTTR; the latter depending on the amount of spare parts available.

The set of spare parts is inclusive of a minimum number of spares for each type of replaceable plug-in unit (see unit list in Chapter 2).

6.7.2 General rules on spare parts management

Before storing the spare units make sure that they are working by inserting them in an operating equipment. It is suggested to periodically check those spare units have not been utilized for over a year.

If the spare parts and the equipment are stored in the same environment, make sure that the spare parts are placed in cabinets to safeguard them from dust and damp.

Moreover, they should also be well grounded to avoid electrostatic discharges.

If the spare parts are stored in another room, or have to be moved from another place, building or site, make sure that the following is observed:

- the spare parts must be wrapped in anti-static and padded envelopes;
- the spare parts must not touch wet surfaces or chemical agents that might damage them (e.g., gas);
- if during transport the temperature is lower than that of the room where they had been kept, make sure that before using them they pass a certain period in a climatic chamber to prevent thermal shocks and/or the possibility of steaming up.

When replacing a unit/sub-unit, make sure that the spare unit/sub-unit is set exactly as the replaced one. For the presettings procedures see section HARDWARE SETTING DOCUMENTATION.
6.7.3 Particular rules on spare parts management

Whenever some units with flash–memories are common to different kinds of equipment or to different versions of the same type of equipment, it is possible to maintain one spare part only: this allows spare part stock saving, even though software downloading will be necessary when the software loaded into the unit (program part or data part) is different from that necessary in the equipment where the spare unit must be used.

At the end of the commissioning phase or after an equipment data change, it is suggested to save the equipment data, e.g. on floppy disk, and store this floppy disk in the spare part stock pointing out the equipment it refers to.

6.8 Repair Form

To facilitate operation, data on the faulty unit must be reported on the form shown in Figure83. The repair form must be filled-in with as much data as possible and returned to ALCATEL together with the faulty unit.
REPAIR FORM
Fill in this form and affix it to the faulty unit to be returned to Alcatel

<table>
<thead>
<tr>
<th>CUSTOMER NAME</th>
<th>ORDER NUMBER/CONTRACT NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE</th>
<th>BRANCH/UNIT/COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTEM/EQUIPMENT</th>
<th>PRODUCT RELEASE</th>
<th>EQUIPMENT SOFTWARE PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATION/RACK</th>
<th>SUBRACK</th>
<th>SLOT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ALCATEL PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SERIAL NUMBER</th>
<th>FAULTY UNIT SOFTWARE VERSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FAULT PHASE**

- [ ] INSTALLATION / TURN ON
- [ ] OPERATION
- [ ] MAINTENANCE

**REASON FOR REPAIR**

- [ ] CLEAR FAULT
- [ ] DROP IN PERFORMANCE
- [ ] INTERMITTENT FAULT
- [ ] UPGRADE/QUALITY ALERT
- [ ] TEMPERATURE FAULT

**PRESUMED CAUSE**

- [ ] INTERNAL
- [ ] LIGHTNING
- [ ] EXTERNAL
- [ ] AIR COND.
- [ ] OTHER

**FAULT STILL PRESENT AFTER REPAIR**

- [ ]

**DATE**

- [ ]

**NAME OF SENDER**

- [ ]

**COMMENTS**

- [ ]

**PROCESSING**

- [ ] STANDARD REPAIRING NOT REPAIRABLE (REJECTED)
- [ ] SUBSTITUTED

**FAULTS DETECTED**

- [ ] SOLDERING / WIRING
- [ ] COMPONENT
- [ ] ADJUSTMENT
- [ ] MECHANICAL
- [ ] PRINTED CIRCUIT BOARD
- [ ] DIRT
- [ ] CORROSION
- [ ] OTHER

**NOTE:** LETTERS ARE FOR FACTORY USE

**COMMENTS**

- [ ]

**DATE**

- [ ]

**REPAIRING NUMBER**

- [ ]

**REPAIRING CENTRE**

- [ ]

**NAME OF REPAIR OPERATOR**

- [ ]

Figure 83. Repair form
DISMANTLING & RECYCLING
7 DISMANTLING & RECYCLING

7.1 WEEE general information


The general principle promoted by this directive is the producer responsibility in the management of the wastes coming from the products he puts on the market.

The producer responsibility now covers the end of life of the products sold.

This new split of responsibility will have impacts on Alcatel practices both as a producer of EEE equipment but also as an owner of EEE equipment.


Two responsibility regimes have been defined:

- **waste of household equipment.** Alcatel only household implication is through its Joint Venture with TCL on mobile phone "TAMP". Alcatel will check the appropriate consideration of the WEEE directive in the Joint Venture which covers the subject by itself independently from the Alcatel e–waste implementation project.

- **waste of professional equipment.** Alcatel owns and produces professional equipment;

As a consequence this Chapter 7 of this handbook focuses on professional equipment responsibility

- regime.

There are two e–waste streams to be considered:

- **Historical e–waste** or waste of equipment put on the market before August 13th 2005

- Two possible regimes left open to implementation in each member state:
  - either the owner of the equipment is responsible
  - or
  - the producer of a new equipment which is purchased to replace an old equipment

- **Future waste** or waste of equipment put on the market after August 13th 2005.

- The producer of the equipment being sold is responsible unless otherwise specified in contract with Customer.

In order to know when a unit or subrack has been put on the market it is necessary to read the date present on the Label affixed on the product (refer to paragraph 3.4 for Label position and type); In the following Figure84. an example is given:
In next paragraphs is given a description example of how to disassemble an equipment; the same principle can be applied to all the subracks and units composing the equipment.

The unit chosen for disassembly is one of the most complex.

- Paragraph 7.2 describes the equipment disassembly; in detail:
  - paragraph 7.2.1 lists all the units composing the equipment with the relevant Waste code.
  - Waste code permits to know the weight of the Subrack or Unit and the percentage of material composing the single item.
  - paragraph 7.2.2 lists the tools necessary for disassembly
  - paragraph 7.2.3 describes the subrack disassembly
  - paragraph 7.2.4 describes the unit disassembly
  - paragraph 7.2.5 describes the procedure to apply in order to manage Hazardous materials and components (example battery)
- Paragraph 7.3 reports the ECO declaration info.

7.2 How to disassembly equipment

This equipment is designed for easy disassembly, by using screws and rivets for mechanical assembly of subracks and modules. The variety of screw types is minimized.
Tools necessary for subrack and units disassembly are reported in paragraph 7.2.2.

The disassembly process depends on the respective recycling methods and can be derived from the delivered assembly instructions of the product.

Table 24 list all the units composing the equipment with the relevant Waste code.

Waste code allows to know the weight of the Subrack or Unit and the percentage of material utilized for the single item.

### 7.2.1 Waste codes detailed information

In Table 24 is listed all the items composing this equipment.

In the column “Waste Code” it is possible to find the weight and the materials composing each “Part Number” according to the following rule:

![Waste Code Diagram](image)

**Material Types:**

- A: Aluminium
- B: Stainless Steel
- C: Steel
- E: Cables
- F: Motors
- G: Plastic
- H: Back Panel
- J: Generic PCB
- K: PCB with electrolytic Capacitors
- L: LCD display (major than 100cm²)
- M: Cathode Ray Tube (Lead, Antimony, Mercury, Phosphors)
- N: Battery (Lithium, Cadmium, Mercury)
- X: Others

**Example:**

W1000J60A20X20  Means:

- W1000 = Overall Weight of the item in grams
- J60 = 60% Generic PCB = 600 grams
- A20 = 20% Aluminium = 200 grams
- X20 = 20% Other materials = 200 grams

**Figure 85. Waste code interpretation**
### Table 24: Items waste codes list

<table>
<thead>
<tr>
<th>NAME</th>
<th>ACRONYM</th>
<th>ANV Part Number (Factory Part Number)</th>
<th>Waste Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMON PARTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAIN UNIT (14XE1 75OHM + 48V)</td>
<td></td>
<td>3AL97237AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>MAIN UNIT (14XE1 75OHM + 24V)</td>
<td></td>
<td>3AL97238AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>MAIN UNIT (14XE1 75OHM + 220V)</td>
<td></td>
<td>3AL97239AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>MAIN UNIT (14XE1 120OHM + 48V)</td>
<td></td>
<td>3AL97237BA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>MAIN UNIT (14XE1 120OHM + 24V)</td>
<td></td>
<td>3AL97238BA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>MAIN UNIT (14XE1 120OHM + 220V)</td>
<td></td>
<td>3AL97239BA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td><strong>TRAFFIC PORTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8X2MB/S RETIMING COAXIAL 75OHM</td>
<td>E1RCB8</td>
<td>3AL97045AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>28X2MB/S 2MM HM 75OHM K20</td>
<td>E1B28</td>
<td>3AL97078AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>8X2MB/S 2MM HM 75OHM K20</td>
<td>E1B8</td>
<td>3AL97078AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>28X2MB/S 2MM HM 75OHM</td>
<td>SE1B28</td>
<td>3AL97078AC**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>8X2MB/S 2MM HM 75 OHM</td>
<td>SE1B8</td>
<td>3AL97078AD**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>28X2MB/S 2MM HM 120OHM K20</td>
<td>DE1B28</td>
<td>3AL97079AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>8X2MB/S 2MM HM 120OHM K20</td>
<td>DE1B8</td>
<td>3AL97079AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>28X2MB/S 2MM HM 120OHM</td>
<td>SDE1B28</td>
<td>3AL97079AC**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>8X2MB/S 2MM HM 120OHM</td>
<td>SDE1B8</td>
<td>3AL97079AD**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>8X2MB/S RJ45 120OHM</td>
<td>DE1JB8</td>
<td>3AL97079BD**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>S1.1 PORT SC/PC (AU4)</td>
<td>OT1B1</td>
<td>3AL97083CA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>L1.1 PORT SC/PC (AU4)</td>
<td>OT1B1</td>
<td>3AL97083CB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>L1.2 PORT SC/PC (AU4)</td>
<td>OT1B1</td>
<td>3AL97083CC**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>1X34MB/S BOARD 75OHM</td>
<td>E3B1</td>
<td>3AL97086AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>1X45MB/S BOARD 75OHM</td>
<td>DS3B1</td>
<td>3AL97086AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>32X2MB/S 2MM HM 120 OHM</td>
<td>DE1B32</td>
<td>3AL97198AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td><strong>EL/OPT MODULES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPTICAL MODULE S-1.1</td>
<td>OMS11</td>
<td>3AL97213AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>OPTICAL MODULE L-1.1</td>
<td>OML11</td>
<td>3AL97213AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>OPTICAL MODULE L-1.2</td>
<td>OML12</td>
<td>3AL97213AC**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>OPTICAL MODULE SFP</td>
<td>SFP1</td>
<td>3AL97213AE**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>POWER SUPPLY</td>
<td>3AL97109AA**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>CA-POWER CABLE.DC48V / 24V.3M</td>
<td>3AL97109AB**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER CABLE.DC48V / 24V.5M</td>
<td>3AL97109AC**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER CABLE.DC48V / 24V.10M</td>
<td>3AL97109AD**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER CABLE.DC48V / 24V.20M</td>
<td>3AL97147AA**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER.EMC.DC48V / 24V.3M</td>
<td>3AL97147AB**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER.EMC.DC48V / 24V.5M</td>
<td>3AL97147AC**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER.EMC.DC48V / 24V.10M</td>
<td>3AL97147AD**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>CA-POWER.EMC.DC48V / 24V.20M</td>
<td>3AL95074AB**</td>
<td>t.b.d.</td>
<td></td>
</tr>
<tr>
<td>POWER SUPPLY CABLE - COMPACT</td>
<td>3AL97082AA**</td>
<td>t.b.d.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EQUIPMENT ACCESSORIES</th>
<th>3AL97254AA**</th>
<th>t.b.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERMINAL CABLE (FORMAT EMPTY</td>
<td>3AL97254AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>TERMINAL CABLE (FORMAT EMPTY</td>
<td>3AL97254AC**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FLASH CARD)</td>
<td>3AL97254AD**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>KIT INSTALLATION 21&quot; (1U)</td>
<td>3AL97254AE**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>KIT INSTALLATION 19&quot; (1U)</td>
<td>3AL97254AF**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>KIT INSTALLATION WALL (1U)</td>
<td>3AL97258AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>KIT-CABLE SUPPORT FOR 19&quot; RACK</td>
<td>3AL97283AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>KIT-CABLE SUPPORT FOR 21&quot; RACK</td>
<td>3AL97169AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>EMC COVER (EMPTY STM1 INTERFACE)</td>
<td>3AL97258AB**</td>
<td>t.b.d.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OFFICE SIDE ACCESSORIES</th>
<th>1AB061220003</th>
<th>t.b.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0-2.3 COAX CONN.(3MM)</td>
<td>1AB074610008</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>RJ45 8P CONNECTOR</td>
<td>3AL97093AA**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>75OHM*5M CABLE</td>
<td>3AL97093AB**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>75OHM*10M CABLE</td>
<td>3AL97093AC**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>75OHM*20M CABLE</td>
<td>3AL97093AD**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>75OHM*30M CABLE</td>
<td>3AL97093AE**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>75OHM*40M CABLE</td>
<td>3AL97093AF**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>120OHM*5M CABLE</td>
<td>3AL97093AG**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>120OHM*10M CABLE</td>
<td>3AL97093AH**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>120OHM*20M CABLE</td>
<td>3AL97093AR**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>FEMALE 2MM 8<em>2M</em>120OHM*30M CABLE</td>
<td>3AL97093AQ**</td>
<td>t.b.d.</td>
</tr>
<tr>
<td>ISA - ES PARTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ISA-ES1 8FE BOARD</td>
<td>ES1 8FE</td>
<td>3AL97165AA**</td>
</tr>
<tr>
<td>ISA-ES1 8FE BOARD</td>
<td>ES1 8FE</td>
<td>3AL97165AB**</td>
</tr>
<tr>
<td>ISA-ES1 3FE BOARD</td>
<td>ES1 3FE</td>
<td>3AL97194AA**</td>
</tr>
<tr>
<td>ISA-ES1 3FE BOARD</td>
<td>ES1 3FE</td>
<td>3AL97194AB**</td>
</tr>
<tr>
<td>ISA-LES1 3FE BOARD</td>
<td>LES1 3FE</td>
<td>3AL97243AA**</td>
</tr>
</tbody>
</table>
7.2.2 Tools necessary for disassembly

The following tools are necessary for unit disassembly:

• # T9 TORX screwdriver
• # T20 TORX screwdriver
• Crosshead screwdriver
• Wrench #
• Scissors
• Protection gloves

7.2.3 Subrack disassembly

In Figure 86. is shown an example of subrack. The same rules can be applied to the specific equipment to be dismantled. In order to disassemble the subrack first remove the boards eventually present, included termination bus.

SUBRACK FRONT VIEW

SUBRACK REAR VIEW

Figure 86. Subrack front and rear view

Procedure:

– Unscrew all the relevant screws present on rear cover as reported Figure 87. (19 pcs total).
– Remove the rear cover in order to access the subrack Back Panel.
Figure 87. Rear cover removing
- Remove the Back Panel from the subrack mechanical structure as indicated in Figure 88.
  a. Remove power cable (A) connected on back panel and remove fans’ cable (B) on main board
  b. Unscrew the screws (6 pcs total) on back panel and remove it.

Figure 88. Back Panel removing
- Remove OE module from subrack by unscrewing the relevant screws as indicated in Figure89.
Unscrew all the screws present on main board (4pcs total) in order to complete the subrack disassembly as indicated in Figure90.
7.2.4 Unit disassembly

Procedure:

– Remove two screws (A) for Front plate removal of general board as indicated Figure91.

Figure91. Front plate removal of general board
– Remove the two screws (B) for OE module removal on OT1B1 board as indicated in Figure92.
7.2.5 Hazardous materials and components

Table 25 lists the presence or not of hazardous substance/components.

**Note:** The system cabling is designed for reduced halogen content. All the traffic cabling is full PVCfree.

Table 25. List of hazardous materials and components present in the equipment

<table>
<thead>
<tr>
<th>Materials/Substances</th>
<th>Presence In The Equipment</th>
<th>Where</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries External (Mercury/NiCad/Lithium/Other)</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Batteries Internal (Mercury/NiCad/Lithium/Other)</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Capacitors with PCB’s</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Capacitors with substances of concern + height &gt; 25 mm, diameter &gt; 25 mm or proportionately similar volume</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Gas discharge lamps</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Mercury containing Backlighting lamps</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Plastic containing brominated flame retardants other than in Printed Circuit Assemblies.</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Liquid Crystal Displays with a surface greater than 100 cm²</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Asbestos</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Refractory ceramic fibers</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Thermal conductive paste</td>
<td>YES</td>
<td><strong>Note:</strong> Protective plastic gloves must be used in order to avoid contact between hands and thermal conductive paste. Pay attention to avoid contact of thermal conductive paste with eyes.</td>
</tr>
<tr>
<td>Radio-active substances</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Beryllium Oxide</td>
<td>NO</td>
<td><strong>Note:</strong> Refer to Figure 92. Copper-beryllium contact spring must be separated from other material and must be fused in a specific regulated environment.</td>
</tr>
<tr>
<td>Other forms of Beryllium</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Pressure volume</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Liquids Volume</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Gasses Volume</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>&quot;Hidden&quot; mechanical springs or other equivalent parts</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Ozone depleting substances, according to those categories that are already banned in the Montreal protocol.</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Chloroparaffins with chain length 10-13 C atoms, chlorination greater than 50% contained in mechanical plastic parts heavier than 25g.</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Lead contained in mechanical parts heavier than 25g.</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Polychlorinated biphenyls (PCB) or polychlorinated terphenyls (PCT)</td>
<td>NO</td>
<td></td>
</tr>
</tbody>
</table>
Polybrominated biphenyl’s and their others (CAS no. 32534-81-9, CAS no. 32536-52-0, CAS no 1163-19-5, CAS no. 13654-09-6) contained in mechanical parts heavier than 25g, in concentrations exceeding the natural background levels.
7.3 Eco declaration

1642EMC is an STM–1 MultiService Node for transmission and cross–connection of a wide range of traditional PDH and SDH signals as well as packed based data flows. It can operate as a multi Terminal or Add/Drop Multiplexer.

Key features
Refer to paragraph 5.1 “General Characteristics”

Weight and Dimensional Characteristics
Refer to paragraph 5.12

EXTENSION OF SYSTEM LIFETIME

The product is designed to ensure an outstanding quality of services through very high traffic transmission, connection and protection performances and minimum service interruption.

The life utility is at least 5 years. This means that maintenance will be assured for at least 5 years.

The system architecture facilitates future extensibility and upgradability:

- On–site configuration changes as for example the extension of the node traffic capacity without re–cabling of interconnections.
- Implementation of new features and functionalities by remote Software download.

The terms and conditions of warranty, service availability and spare parts availability are individually agreed between Alcatel and the Customer and are part of the relevant contractual commitments.

POWER CONSUMPTION
Refer to paragraph 5.10.1

RADIO FREQUENCY EMISSION
Regarding compliance with radio frequency emission requirements refer to paragraph 5.13.1

ACOUSTICAL NOISE
Refer to paragraph 5.13.3

MATERIALS
Refer to Table25 for details.

DISASSEMBLY
Refer to paragraph 7.2

BATTERIES
The product requires no backup batteries.

PACKAGING

The packaging of this Alcatel equipment complies with the directive 94/62/EEC concerning packaging and packaging waste. Depending on the means of transportatio,n the racks are packed in a cardboard or wooden box, which can easily be recycled after use. Environmentally harmful materials are not used for packaging. The packaging materials are marked according to ISO 11 469. If required by the Customer and agreed by both parties, Alcatel can take care of the proper disposal of all packaging materials.

For details refer to” Installation Handbook".
TAKE BACK INFORMATION

On request of customers, Alcatel can take care of the take back of depreciated equipment and of the ecological safe and appropriate disposal under conditions to be agreed.

For that purpose Alcatel co–operates with qualified companies.

DOCUMENTATION

In order to reduce paper consumption for Customer Documentation, Alcatel delivers the Generic Customer Documentation on a CD–ROM. The CD–ROM contains interactive HW Descriptions, SW Descriptions, Functional Descriptions, Maintenance Manuals and User Guides. This allows the operator to put the documentation on a server accessible by all relevant people in the organization without any additional paper copies.
UNITS DOCUMENTATION LIST

This section contains the documents sheets to refer to for unit/sub-unit hardware setting options. The list of the enclosed documents is given in Table 27, according to the ANV part number.

TABLE EXPLANATION:

- **UNIT IDENTIFICATION P/Ns AND CHANGE STATUS**
  
  Each unit or sub–unit is distinguished by:
  
  - a dual Part No.:
    - Factory P/N (4xx.xxx.xxx x)
    - ANV P/N (xxx.xxxxx xx) (NOTE)
  
  **NOTE** The last two ANV–P/N letters (in the following stated as "suffix") stand for a "feasible alternative", they might differentiate two units even though still functionally compatible. For this reason the indicated ANV P/N does not include the last two letters.

  For example: the units having P/Ns "3AL-34065-AAAA" and "3AL-34065-AABA" are functionally compatible and, as regards to hardware settings, the MSxxx document (described hereafter) 3AL-34065-AAAA–MSxxx is applicable for both.

  - and by a pair of design & production series (change status):
    - CS, associated to the Factory P/N (4xx.xxx.xxx x)
    - ICS, associated to ANV P/N (xxx.xxxxx xx)
  
  The following table shows an example of correspondence between "FACTORY P/N + CS" and "ANV P/N + ICS"

<table>
<thead>
<tr>
<th>FACTORY CODE</th>
<th>ANV CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>P/N</td>
<td>CS</td>
</tr>
<tr>
<td>487.156.612</td>
<td>01</td>
</tr>
<tr>
<td>487.156.612</td>
<td>02</td>
</tr>
<tr>
<td>487.156.612</td>
<td>03</td>
</tr>
</tbody>
</table>

In this example you can see that the production series is identified only by the CS as far as the Factory code is concerned, and by the 'suffix + ICS' if the ANV code is referred to.

Some of the possible positions of the label indicating the unit’s P/Ns and CS-ICS are illustrated in para. 4.4

- **CROSS-REFERENCE**

  - **Id.** Unit alphabetical notation. It indicates the unit containing one or more subunits.
  - **App.** It reports the unit notation (Id) to which the sub-unit belongs.

The HARDWARE SETTINGS can be executed after having checked all the sub-units belonging to a unit, by considering the above cited cross-reference, and by using the presetting documents indicated in Table 27, page 634 and presented in the following point.
ENCLOSED DOCUMENTS

For each type of unit or sub-unit having customizing setting options, the document "ANV P/N"-MSxxx

is annexed to this handbook (in the case of Documentation on CD–ROM the MSxxx documents may be given in a CD–ROM different from that containing this Technical Handbook).

The MSxxx documents are enclosed in numerical order. The Edition of the enclosed MSxxx document is the highest available on the date on which the Technical Handbook is assembled.

Use of the document MSxxx:

- MSxxx means "document for hardware presetting options" (the MSxxx document’s Part No. is as that of the unit or sub–unit and its MS acronym defines type).
  The xxx part of MSxxx is relevant to ANV internal identification codes.

- As the Customer may have to manage many units of the same type (same P/N) but with different CS-ICS, the document MSxxx describes with possible different chapters the different setting options, according to all the possible CSs-ICSs. For this purpose, a table at the beginning of document (PREFACE) indicates the chapter to be used according to the CS or the corresponding 'suffix + ICS', taking into account that:
  - a change of the production series does not necessarily imply a change in the setting options;
  - a change of the ANV P/N suffix does not imply a new MSxxx document;
  - the CS, SUFFIX and ICS must be meant as:
    from specified CS, SUFFIX or ICS (included)
    to next CS, SUFFIX or ICS (excluded) if listed
  - the sequence of CSs is increasing from alphanumeric to numeric (e.g. CS=A0 is lower than CS=01).

  Each chapter contains:

  - one or more tables defining the relationship between the functions achievable and the setting options to make;
  - the unit layout drawing which shows the exact location of all the setting options.

N.B. IDENTIFIES PIN 1 OF COMPONENT

N.B. When necessary to make "TC" Hardware Settings fitted on the rear side of the board, remove the protective cover plate present on the same rear side and replace it at the end of the operation.

The setting options described in the documents MSxxx must be used according to 3AL377470001 (962.000.022 F) MSxxx document, inserted in Table27, which shows the 'ON' (closed) position of microswitches.

Those setting options that on the table are indicated by the caption For factory use only should never be modified.

EXAMPLE

N.B. The P/Ns used in this example have no correspondence with those of the actual equipment part list!

Taking into account the same unit of Table26:

<table>
<thead>
<tr>
<th>FACTORY CODE</th>
<th>ANV CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>P/N</td>
<td>CS</td>
</tr>
<tr>
<td>487.156.612</td>
<td>01</td>
</tr>
<tr>
<td>487.156.612</td>
<td>02</td>
</tr>
<tr>
<td>487.156.612</td>
<td>03</td>
</tr>
</tbody>
</table>
and supposing that the setting options valid for CS=01 are equal to those for CS=02, but change for CS=03, the table at the beginning of the document 3AL 34422 AAAA MSZZQ will be:

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>FACTORY P/N CODICE DI FABBRICA</th>
<th>ANV P/N CODICE ANV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FROM CS DA CS</td>
<td>FROM SUFFIX DA SUFFISSO</td>
</tr>
<tr>
<td>1</td>
<td>01 --AA 01</td>
<td>01</td>
</tr>
<tr>
<td>2</td>
<td>03 --AC 01</td>
<td>01</td>
</tr>
</tbody>
</table>

If you have the unit identified by one of this identification data:

<table>
<thead>
<tr>
<th>FACTORY CODE</th>
<th>ANV CODE</th>
<th>P/N CS</th>
<th>ANV CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>487.156.612</td>
<td>01</td>
<td>3AL 34422 AAAA</td>
<td>01</td>
</tr>
<tr>
<td>487.156.612</td>
<td>02</td>
<td>3AL 34422 AAAB</td>
<td>01</td>
</tr>
</tbody>
</table>

you will use **Chapter 1** of document **3AL 34422 AAAA MSZZQ**

If you have the unit identified by one of this identification data:

<table>
<thead>
<tr>
<th>FACTORY CODE</th>
<th>ANV CODE</th>
<th>P/N CS</th>
<th>ANV CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>487.156.612</td>
<td>03</td>
<td>3AL 34422 AAAC</td>
<td>01</td>
</tr>
<tr>
<td>487.156.612</td>
<td>04</td>
<td>3AL 34422 AAAD</td>
<td>01</td>
</tr>
</tbody>
</table>

you will use **Chapter 2** of document **3AL 34422 AAAA MSZZQ**

**Table27. Hardware presetting documentation**

The edition of the documents (listed in this table) that are physically enclosed in the handbook is the highest available when this handbook is assembled. The edition of enclosed documents is not specified in this table.

<table>
<thead>
<tr>
<th>Id</th>
<th>NAME</th>
<th>App</th>
<th>ANV P/N (Factory P/N)</th>
<th>Document for hardware presetting</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>ISA-ES1 8FE</td>
<td></td>
<td>3AL 97165 AA--</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>ISA-ES1 3FE</td>
<td></td>
<td>3AL 97194 AA--</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>ISA-LES1 3FE</td>
<td></td>
<td>3AL 97243 AA--</td>
<td></td>
</tr>
</tbody>
</table>

**END OF DOCUMENT**