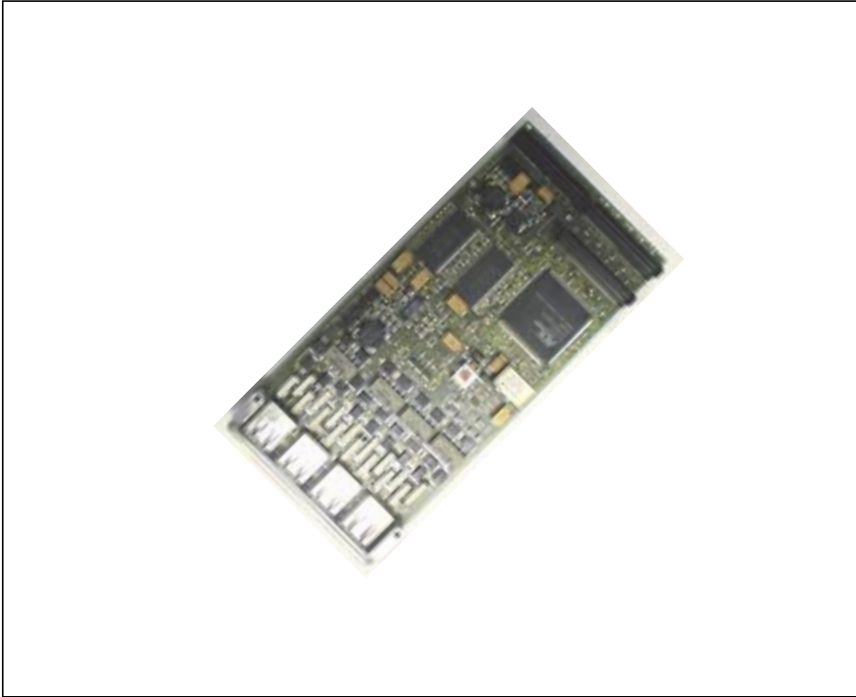




SS7 CommunicationController E1/T1/J1

Supporting MTP-L2 applications

TelORB Installation Guide

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1 Introduction

1.1 About This Guide

This Guide is designed to provide instructions to install an SS7 Communication E1/T1 Board with its associated FE and device driver in a TelORB TP.

This Guide is divided into the following chapters:

- Chapter 1, "*Introduction*", covers the principles that are used in this guide.
- Chapter 2, "*Product Overview*", shows the different parts of the SS7 Communication Controller-PMC E1/T1 board and the interaction with the FE-MTP-L2-IF application via its associated driver.
- Chapter 3, "*Installation*", explains the necessary steps to install the board and the associated driver. It also describes how to install the FE software.
- Chapter 4, "*Operating the FE Interface*", describes how to start the Front End interface, and how to handle hardware and driver errors.
- Chapter 5, "*Error Codes*", lists the error codes that may be encountered during start-up and operation.

This guide does not cover how to configure the FE from a telecom point-of-view. For instructions on that subject, see *Ref.2*.

For information on how to install the BE, see *Ref.3*.

1.2 Typographic Conventions

The ↵ symbol represents hitting the “Enter” key on the keyboard.

File names, directories, etc. are written in bold font. Example: **ss7.cnf**.

Text that you may type in a command line is written in this font.
Example: `setenv XENVIRONMENT ss7mgr.res ↵`

When a parameter can be user-defined it is written between the symbols “<” and “>”.

When an instruction says:

Copy the file and give it a new name by executing the command:
`cp cnf_template.cnf <name of cnf file>`

The command given could be:

`cp cnf_template.cnf cnf_1.cnf`

When a parameter can be of a finite set, the possible variants are written between the symbols “[” and “]”, with each possible value separated with the symbol |.

When an instruction says:

The possible values of the keyword

`EINSS7_FE_AUTOSTART_FE_<no.>` are “autostart” or “no_autostart”. Add the following keyword:

`EINSS7_FE_AUTOSTART_FE_1=" [autostart | no_autostart"`
in the file.

The statement given could be:

`EINSS7_FE_AUTOSTART_FE_1="no_autostart"`

or:

`EINSS7_FE_AUTOSTART_FE_1="autostart"`

1.3 Installation Prerequisites

Readers

It is assumed that the reader of this Guide is familiar with:

- Basic Solaris usage.
- Basic TelORB usage.
- How to install additional PMC boards on TelORB TP.
- The root password for the used target computer in UNIX based systems.

Software

The minimum software requirements for the I/O computers are:

Sun Solaris

Basic version:	Solaris 2.7
Patch:	Following library: libXpm.so.4.1 This can be fetched from SUN.

All by SUN recommended patches should be installed.

The minimum software requirements for the TP computers are:

TelORB

Basic version:	Dicos R 13
Patch:	DFS R 13 Intel PC PROM

Hardware

The system needs the following hardware:

- TelORB cabinet, including two Sun Sparc Workstations acting as I/O processors and two ethernet switches connecting the I/O processors with the traffic processors.
- MXP-64 PC-board(s) to replace the ordinary traffic processors in the TelORB cabinets.
The standard traffic processors cannot host the SS7-PCM boards. The TPs which shall carry the SS7-PCM boards must be replaced with MXP-64 boards.
- SS7-PMC E1/T1/J1 board(s).

1.4 Terms

ANSI	American National Standards Institute.
API	Application Program Interface.
ASCII	American Standard Code for Information Interchange.
BE	Node and/or function for the upper part of the SS7stack (MTP-L3 and up).
CET	Central European Time.
CP	Common Parts. A module handling IPC, memory management and other operating system dependent functions.
DMA	Direct Memory Access.
Doorbell	Interrupt register for handling out of sequence alarms and signals.
DTMF	Dual Tone Multiple Frequency.
E1	Telephone term given to a digital transmission circuit where the bandwidth is equal to 32 voice channels (actually, digital transmission link with capacity 2.048 Mbit/s). E1 links are the ITU-T standard link type.
EIN	Ericsson Infotech AB.
FALC	Framing And Line interface Component.
FE	Front End.
FPGA	Field Programmable Gate Array.
FS	Functional Specification.
FSM	Finite State Machine.
HA	High Availability.
HSN	Hardware Selection Number. The physical link ID number.
HW	Hardware.
IF	Interface.
I/O	Input or Output.
IOCTL	I/O Control Code in an IRP.
IPC	Inter Process Communication.
ISR	In-System Re-configurable FPGA.
IVR	Interactive Voice Recognition.

ITU-T	International Telecommunication Union-Telephony.
J1	J1 links are the TTC standard link type.
MGMT	Management.
MSU	Message Signal Unit.
MTP	Message Transfer Part.
MTP-L1	Message Transfer Part Level 1.
MTP-L2	Message Transfer Part Level 2.
MUX	Multiplexer circuit.
OSI	Open System Interconnect.
PC	Personal Computer.
PCI	Peripheral Component Interconnect.
PCM	Pulse Code Modulation; in this document, “PCM” means the physical E1 or T1 interface.
PLD	Programmable Logic Device.
PMC	PCI Mezzanine Card.
RAM	Random Access Memory.
Rx	Receive.
SDL	Signalling Data Link. The ID number of a physical link TS.
SDRAM	Synchronous Dynamic RAM.
SLM	Signalling Logic Management.
SMH	Signalling Message Handling.
Solaris	Operating system used in SUN computers
SS7	Signalling System No. 7, protocol used by telephony equipment, e.g. switches.
SS7-PMC-E1/T1/J1	SS7 Communication Board - PMC T1/E1/J1.
STS	Signalling Time Slot.
SW	Software.
T1	Telephone term given to a digital transmission circuit where the bandwidth is equal to 24 voice channels or 1536 Keeps (actually, 1544Kbps with 8Kbps used for overhead). T1 links are the ANSI standard link type.
TP	Traffic Processor.
TS	Time Slot.

TTC	Japanese Telecommunication Technology Council.
tWFC	Timer Wait For Connection.
Tx	Transmit.
USB	Universal Serial Bus.
VTs	Voice Time Slot.

1.5 References

- Ref.1* Functional Specification,
 155 17-CAA 201 611 Uen, Rev F
- Ref.2* Ericsson SS7 for TelORB Configuration Guide,
 198 17-CXP 901 45, Rev A
- Ref.3* Ericsson SS7 for TelORB Installation Guide,
 EN/LZT 108 4344 Uen, Rev A

2 Product Overview

SS7 Communication Controller Boards and the related driver software are used to connect PCM links to telephone networks.

The SS7-PMC-E1/T1/J1 board uses USB connectors, and handles four PCM links, each capable of handling up to 31 signalling links.

After initiating order from management or auto-start, FPGA is loaded with its application program. Input and output data is stored in an SDRAM memory bank which makes up the DMA buffers.

2.1 SS7-PMC-E1/T1/J1 Board

Product Contents

A product hardware delivery (KDY 209 97/1) contains:

- One SS7-PMC-E1/T1/J1 board (ROA 209 21/1), contained in a static-protective package.
- One cable set (RPM 113 4628/1) for E1 (75 ohm) PCM connection.
- One cable set (RPM 113 4165/2) for E1/T1 (100/120 ohm) PCM connection.

A product software delivery consists of the following contents:

- Software modules and documentation:
 - SS7-PMC-E1/T1/J1 Device Driver
 - SS7-PMC-E1/T1/J1 software module (FE-MTP-L2-IF)

- Configuration file templates
 - FPGA binary file
 - Documentation files
- Functional Specification *Ref.1*

SS7-PMC-E1/T1/J1 Board Description

Each SS7-PMC-E1/T1/J1 board can connect to four separate PCM links of the E1, T1 or J1 type and offers a total of 31 (E1) or 24 (T1) time slots to be interconnected via multiplexing on each SS7-PMC-E1/T1/J1. Cable sets are included in the hardware delivery for the physical connection of the PCM links.

SS7-PMC-E1/T1/J1 is installed in a Front End target computer using the PMC bus. The board panel contains four USB type connectors for the respective PCM links.

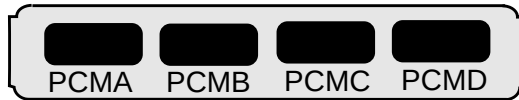


Figure 1 SS7-PMC-E1/T1/J1 panel with PCM link connectors.

On the component side of the card, there is a rotary switch ranging from 0-7 to assign a unique identity to each installed SS7-PMC-E1/T1/J1. In this way, a physical board can be tied to a specific physical PCM link connection in the FE-MTP-L2-IF software. This is performed when the configuration files for the FE-MTP-L2-IF software are set up.

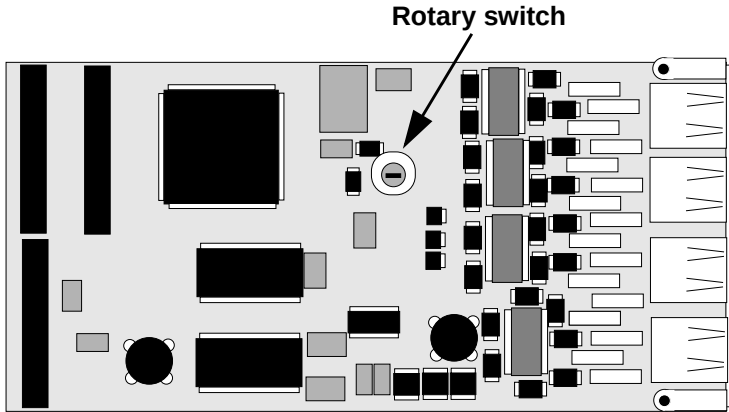


Figure 2 SS7-PMC-E1/T1/J1 component side with rotary switch for identity (Hardware Serial Number) selection.

SS7-PMC-E1/T1/J1 accommodates the MTP-L1 and MTP-L2 functions in the overall SS7 signalling system. It is based on a Field Programmable Gate Array (FPGA) which is programmed and configured during the start-up phase to handle the MTP-L1 and the MTP L2 functions. It communicates with the Front-End MTP-L2 Interface using the SS7-PMC-E1/T1/J1 driver over the target computer PMC bus.

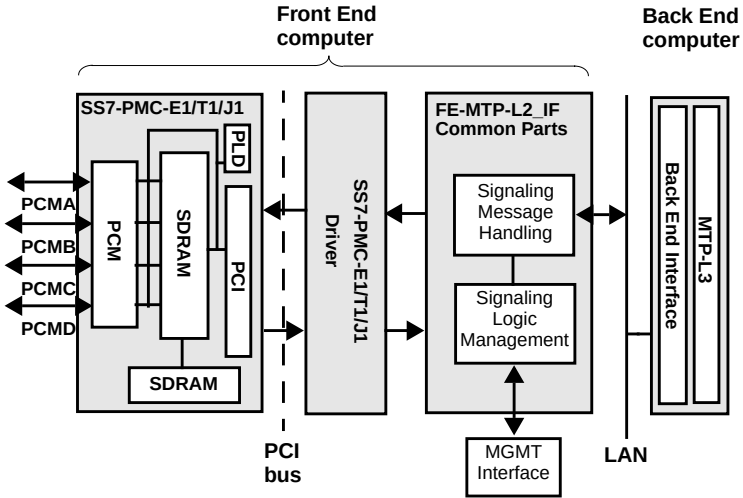


Figure 3 Overview of the SS7-PMC-E1/T1/J1 Driver and example of Front End MTP-L2 Interface and example of Back End.

The PCM signals are fed to/from SS7-PMC-E1/T1/J1 via a multiplexer for PCM, which handles protocol conversion and cross connection of time slots (TS). The PMC bus is connected to SS7-PMC-E1/T1/J1 via a PCI interface circuit.

After initiating order from management or auto-start, FPGA is loaded with its application program. Input and output data is stored in an SDRAM memory bank which makes up the DMA buffers.

2.2 Operation and Management

The SS7 Manager is used for operation and management. To be able to handle several FEs and a BE (stack part instances) separate instances of the SS7 manager is started. Each of these SS7 Managers communicates with their FE or BE. If all SS7 Managers run on the same I/O machine they must use different ports to communicate with their instance of the stack.

This means that the MSGIPA address in the CP configuration file for each stack part instance must have unique port numbers stated for XMGMT. Use the same CP configuration file as for the stack part instance when you start the corresponding SS7 Manager.

In practice this means that you change the UNIX environment variable `SS7_CP_CONFIGFILE` to point at different CP configuration files before you start the different instance the SS7 Manager.

This procedure is not necessary if you use autostart for the FE processes. In this case you use the SS7 Manager only to control the BE.

2.3 File Systems

Note that the I/O computers and the TPs has different roots of their top-level directories.

The TPs file system root (top-level directory, */*) corresponds to the directory **/opt/telorb/axe** as seen by the I/O computer.

All path references to files defined in the system-specific `epct-file` and the `.cnf` files shall be from the TPs point-of-view. All path references set in UNIX environment variables shall be from the I/O computers point-of-view.

3 Installation

3.1 Validation of Pre-installed Parts

Before the installation is started, you must ensure that all required hardware and software is installed, see section 1.3. It is assumed that the MXP-64 boards are already installed and verified to work as ordinary TPs.

3.2 Installing the Hardware

- 1 Power off the target MXP-64 board.
- 2 To protect the board from electrostatic discharge, use a wristband to connect yourself to the metal chassis of your target computer. Use the wristband as long as you are handling the board with your hands. Avoid moving around with the board in your hands, since this may cause static electricity build-up.
- 3 Pull out the board from the TelORB cabinet.
- 4 Open the static-protective package containing the board, and grasp the board by the metal panel and edges. Avoid touching board connectors and components.
- 5 If you install more than one board in your TelORB system, be sure to set the rotary switch on each board to different numbers. Numbers can be set from 0 to 7 (corresponds to device driver file names ranging from 0-7, e.g., `e1t1driver01_0`). The standard arrangement is that the first (or only) card is set to “0”,

the next is set to “1”, and so on. However, each board can have any number as long as it is different on all boards. Make a note on which number is used for the board.

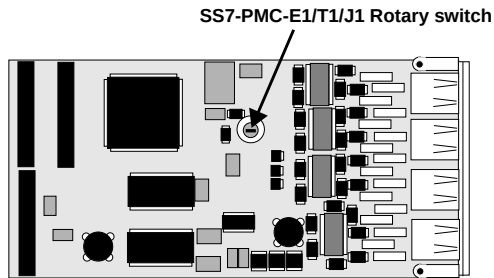


Figure 4 Rotary switch positions.

- 6 Insert the board. Align the board with the expansion slot, and press firmly until the board is fully seated
- 7 Push the MXP-64 board into the slot in the TelORB cabinet.
- 8 If you intend to install more than one board in your target computer, repeat step 1 to step 7 for the rest of the boards.
- 9 Power on the MXP-64 board(s).

3.3 Installing the SS7 Software

- 1 Down-load and install the software according to instructions in *Ref.3*.
- 2 Edit the system-specific epct file. Add the name of the SS7-PMC-E1/T1/J1 driver IDP in the SOFTWARE section. The name of the driver IDP is stated in the file **\$EINSS7HOME/delivery_doc/readme.txt**.
- 3 Edit the system-specific epct file. Add the name of the SS7 stack IDP in the SOFTWARE section. The name of the stack IDP is stated in the file **\$EINSS7HOME/delivery_doc/readme.txt**.
- 4 Edit the system-specific epct file. Add the Poolname for the driver in the PROCESSOR section(s) that corresponds to the TP(s) on which you want to execute the driver. The name of the pool is stated in the file **\$EINSS7HOME/delivery_doc/readme.txt**.
- 5 Edit the system-specific epct file. Add the Poolname for the FE in the PROCESSOR section(s) that corresponds to the TP(s) on which you want to execute the FE(s). The name of the pool is stated in the file **\$EINSS7HOME/delivery_doc/readme.txt**.

3.4 Setting up UserIDs for the FEs

Every FE process must have a userID associated with it. Follow the steps below to associate a userID with an FE process.

- 6 Change directory to **\$EINSS7HOME**
- 7 For every TP on which you want to execute an FE, repeat step 8.

- 8 Edit the system-specific `epct` file. Define a `userID` for the FE by adding the rows
`EINSS7_FEIF_<procID>="<userID>"`
in the section `ENVIRONMENT DATA`.
`<procID>` is replaced with the number of the TP on which the FE shall execute.
`<userID>` is replaced with the `userID` you want to use. It is recommended that you use the following naming convention for the `UserID`:
`USER_<no.>`, where `<no.>` is replaced with the number of the TP on which the FE shall execute.
See example below:

```
...  
ENVIRONMENT DATA  
...  
EINSS7_FEIF_UID_1="FE_1"  
EINSS7_FEIF_UID_2="FE_2"  
...  
ENDDATA  
...
```

Figure 5 Example of definition of FE `UserID`

3.5 Creating CP Configuration Files

- 9 For every FE process, repeat step 10.
- 10 Copy the template CP configuration file **`$EINSS7HOME/cnf/cp_template.cnf`**. The destination of the file must be **`/axe/cnf`** and the name must be unique for each FE process. It is recommended that you use the following naming convention:
`cp_<no.>.cnf`, where `<no.>` is replaced with the number of

the TP on which the FE shall execute.

3.6 Connecting CP Configuration Files

Each FE process must have an associated CP configuration file. Follow the steps below to associate an FE process with a CP configuration file.

- 11 Change directory to **\$EINSS7HOME**
- 12 For every TP on which you want to execute an FE, repeat step 13 to 15.
- 13 Edit the system-specific epct-file. Add path and filename to the CP configuration file for the FE process by adding the row `SS7_CP_CONFIGFILE_FE_<no.>=<file>` in the section `ENVIRONMENT DATA`.
<no.> is replaced with the number of the TP on which the FE is executing, defined in step 8.
<file> is replaced with the path and filename of the CP configuration file that you created in step 10. Note that the path is the path on the I/O.
See example below:

```
...  
ENVIRONMENT DATA  
...  
SS7_CONFIGFILE_FE_1="/cnf/cp_1.cnf"  
SS7_CONFIGFILE_FE_2="/cnf/cp_2.cnf"  
...  
ENDDATA  
...
```

Figure 6 Example of CP configuration file location statement

- 14 Edit the system-specific epct file. Define if you are using

autostart or not for the FE process by adding the row
EINSS7_FE_AUTOSTART_FE_<no.>="[autostart |
no_autostart]"
in the section ENVIRONMENT DATA.
<no.> is replaced with the number of the TP on which the FE
is executing, defined in step 8.
Either you use autostart or no_autostart as a value for
the keyword.
See example below:

```
...  
ENVIRONMENT DATA  
...  
EINSS7_FE_AUTOSTART_FE_1="autostart"  
EINSS7_FE_AUTOSTART_FE_2="no_autostart"  
...  
ENDDATA  
...
```

Figure 7 Example of autostart options

It is not recommended to use autostart, although it is supported.

- 15 Edit the system-specific epct file. Define if you are using trace
or not for the FE process by adding the row
EINSS7_FE_TRACE_FE_<no.>="[t | no_t]"
in the section ENVIRONMENT DATA.
<no.> is replaced with the number of the TP on which the FE
is executing, defined in step 13.
Either you use t or no_t as a value for the keyword. t sets
trace on, no_t sets trace off.
The trace option must be set to t in order for the Log-daemon
to be activated for the process. The location of the log-file is
stated in the CP configuration file for the Log-daemon.
See example below:

```
...  
ENVIRONMENT DATA  
...  
EINSS7_FE_TRACE_FE_1="t"  
EINSS7_FE_TRACE_FE_2="no_t"  
...  
ENDDATA  
...
```

Figure 8 Example of trace options

3.7 Setting up TCP/IP IPC

In order to use TCP/IP communication, for example between the FE processes and the management tools, the symbolic addresses of the hosts and their corresponding TCP/IP addresses must be stated in the system-specific `epct` file.

Follow the steps below to set up TCP/IP communication.

- 16 Change directory to **\$EINSS7TELOBRHOME**
- 17 For each FE process, repeat step 18 to step 20.
- 18 Edit the system-specific `epct`-file. Add the following keywords in the section `INITIAL DATA`:
`SymbolicAddress_<no.>`
`NumericAddress_<no.>`.
`<no.>` is replaced with a running number that maps a symbolic address to a TCP/IP-address.
See example below:

```
...  
INITIAL DATA  
...  
SymbolicAddress_1="FE_1"  
NumericAddress_1="150.132.40.28"  
...  
ENDDATA
```

Figure 9 Example of mapping between symbolic addresses and TCP/IP addresses.

- 19 Edit the CP configuration file for the process. Add a new MSGIPA keyword for each message port owner you want to reach using TCP/IP. The parameter is the symbolic address of the current process, defined in step 18, or the TCP/IP address, directly followed a colon and a port number. Additional addresses can be defined in case that the message port owner is associated with additional hosts or port-numbers. Separate the different addresses with a comma.
The name and location of the CP configuration files are defined in the system-specific epct file. For more information about MSGIPA, see *Ref.2*. Most part of these definitions are made in the template files.
See example below:

```
...  
MSGIPA=FE_1:6005  
MSIPA=150.132.203.60:6006  
...
```

Figure 10 Example of definition of TCP/IP IPC

- 20 Edit the CP configuration file for the process. Add the

LOGLDIPA keyword for the Log-Daemon. You also need to define this keyword in the configuration file for the Log-Daemon (if it has a CP configuration file of its own and does not read the BE's). The parameter is the TCP/IP address for I/O computer running the Log-Daemon followed by a colon and a port number. The name and location of the CP configuration files are defined in the system-specific epct file. For more information about LOGLDIPA see *Ref.2*.

See example below:

```
...  
LOGLDIPA=150.132.40.19:6005  
...
```

Figure 11 Example of definition of Log-daemon address

3.8 Setting up Dicos Ports IPC

If you are using Dicos ports for inter-process communication between any of the SS7 processes, typically between the FE(s) and the BE, follow the steps below to set it up.

- 21 Change directory to **\$EINSS7HOME**
- 22 For each FE process using Dicos port communication, repeat step 23.
- 23 Edit the CP configuration file for the process. Add a new MSGIPA keyword for each message port owner you want to reach using Dicos port communication. The parameter is the UserID of the process followed by the keyword EINSS7CP_TELORB and a port number.
The name and location of the CP configuration files are defined

in the system-specific epct-file.
See example below:

```
...  
MSGIPA=FEIF_02,EINSS7CP_TELORB:6005  
...
```

Figure 12 Example of definition Dicos IPC

3.9 Completing the FE installation

- 24 Configure the FE (s) from a telecom-point of view.
See *Ref.2* for information about configuration parameters.
See *Ref.3* for information about which files you can configure.
The configuration can be done using DCM, or using a text-editor.
- 25 Change directory to **\$EINSS7TELORHOME**.
- 26 Register the IDPs by executing the command:
`epconfig set -r *` ↵
- 27 Create the bootloadtable file, enter the command:
`epct -d <bootloadtable-directory> -t i486-F -v
+c <mySystem>.epct` ↵
Replace `<mySystem>.epct` with the name of the system-specific epct file.
Replace `<bootloadtable-directory>` with the name of the directory where you want your installation file tree to reside.
See example below:

```
>epct -d /tmp/axe -t i486 -F -v +c mySystem.epct
```

Figure 13 Example of creation of bootloadtable-files.

- 28 Change directory to **<bootloadtable-directory>**.
- 29 Create a tar-file of the directory sub-tree by issuing the command:

```
tar -cvf <tar-file> ./ ↵
```

Where **<tar-file>** is the name of the tar-file to be created.

3.10 Loading the FE into the TPs

- 30 Log into the I/O computer.
- 31 Change directory to **/axe**.
- 32 FTP the tar-file created in step 29 to this directory.
- 33 Un-tar the file by entering the command:

```
tar -xvf <name of tar-file>
```
- 34 Remove the tar-file.
- 35 Start up a console for each TP in TelORB. For each TP, execute the command:

```
xterm -ls -sb -fn 8x13 -geometry 72x13+40+0 -  
title "<Title>" -e tcsh -c 'telnet <I/O ID>  
<Port no.> | tee <logfile>' & ↵
```

Replace **<Title>** with the title of the window, preferably the number of the TP.

Replace **<I/O ID>** with the logical name of the I/O processor.

Replace **<Port no.>** with the port number for the terminal

server SW.

Replace <logfile> with the name and path of the log-file for the console.

For information on other arguments, see the man-pages for xterm.

See example below:

```
xterm -ls -sb -fn 8x13 -geometry 72x13+40+0 -title  
"TP:2" -e tcsh -c 'telnet <I_0_1> 6005 | tee  
con_tp2.log' &
```

Figure 14 Example of start-up command for TP console window

- 36 Reset the TP set up as Primary Loader. Wait until it starts to load, this normally takes about 5-10 seconds.
- 37 Reset the TP set up as Secondary Loader. Wait until it starts to load, this normally takes about 5-10 seconds.
- 38 Reset the other TPs.
- 39 Now is the stack initializing.

3.11 Adding an FE Process

- 40 Repeat step 5 to 39.
- 41 Note that if the FE processes does not have the autostart option, a separate SS7 Manager is needed for each FE process and the BE. See section 2.2 for details.

3.12 Concluding the SS7 MTP-L2 installation

and configuration

The installation of the SS7-PMC-E1/T1/J1 board, driver software, and FE software is now completed.

The delivery contains a number of sample configuration files, which must be modified to suit your needs. The configuration files are described in the Configuration File Description (*Ref.2*).

3.13 Installation File Structure

See *Ref.3*.

4 Operating the FE Interface

4.1 Starting the Front End Interface

The Front End interface supports both autoinitialization and initialization via a management interface.

Autoinitialization

When “autostart” is used as an parameter in the system-specific epct file, the primitives forming the starting order are sent internally at initialization.

It is recommended to use autostart.

Initialization via MGMT

When start via MGMT is used the primitives are sent using a management interface, normally the SS7 Manager. See *Ref.1* for information about the MGMT primitives used.

4.2 Trouble-shooting

Hardware and driver errors

If the installation and start-up fails:

- For a description of error messages reported in the log file, see

chapter 5 "*Error Codes*".

5 Error Codes

5.1 ERROR CODES

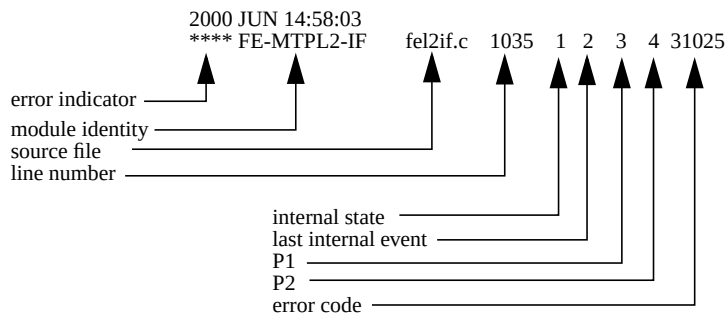


Figure 15 Format of error entries in the log file

When an error occurs, an entry in the SysLog file will be produced. Each entry has the layout shown in the figure above. The meaning of each error code as well as the parameters P1 and P2 in each case is explained in the table below.

The following error codes will be used together with a base module specific error code number, 31000, to log different error cases in the Front-End MTP-L2 Interface module.

Error	Description	P1	P2
1 IFE_MEM_ALLOC_ERROR	It was not possible to allocate a fixed memory block from the process memory pool.	0	0
2 IFE_TIMER_REQ_ERROR	An attempt to start a timer has failed	0	0
3 IFE_MEM_FREE_ERROR	An attempt to free memory has failed.	0	0
4 FILE_OPEN_ERROR	An attempt to open a file has failed	0	0
5 ERROR_FGETS_CNF_FILE	An attempt to read a whole line from the configuration file has failed	0	0
6 ERROR_SSCANF_CNF_FILE	An attempt to interpret the read line of data from the configuration data has failed.	0	0
7 ERROR_CNF_FILE_VERS	The Front-End MTP-L2 Interface configuration file version is wrong.	Version number read from the config file.	0
8 FILE_CLOSE_ERROR	An attempt to close a file has failed	0	0

Error	Description	P1	P2
9 ERROR_INVALID_PRIMITIVE	An undefined primitive has received.	Received primitive number.	Sender. Will be 0 if the message is received from the board.
10 ERROR_INVALID_IFE_STATE	The value of the state attribute is out of range (fatal error). Front-End MTP-L2 Interface will exit if this happens.	0	0
11 ERROR_INVALID_MODULE_ID	The module name read in the main configuration file for the Front-End MTP-L2 Interface module can not be mapped to any module ID, defined in the Common Parts configuration file.	0	0
12 L2_CONFIG_FILE_OPEN_ERROR	An attempt to open the MTPL2-MTPL1 configuration file has failed.	0	0
13 FILE_SEEK_ERROR	The offset value to read from the configuration file is too large.	offset value	0
14 ERROR_INVALID_DRV_NAME	The device driver name in the main configuration file for the Front-End MTP-L2 Interface module is wrong.	0	0
15 ERROR_INVALID_DIAGNOSTICS_FLAG	The value of the diagnostic test flag in the main configuration file for the Front-End MTP-L2 Interface module is invalid.	0	0

Error	Description	P1	P2
16 L2TEST_FILE_OPEN_ERROR	An attempt to open the binary diagnostic test file has failed.	0	0
17 MTPL2_FILE_OPEN_ERROR	An attempt to open the binary MTPL2 file has failed.	0	0
18 EVENT_IN_WRONG_STATE	A valid event has received in wrong state.	0	0
19 ERROR_MTP_CNF_FILE_VERS	The version number of the MTPL2-MTPL1 configuration file is invalid.	Read version number.	0
20 ERROR_TOO_MANY_MTP_TEMPLATES	The number of templates in the MTPL2-MTPL1 configuration file is invalid.	Read number of templates	0
21 ERROR_BAD_MTP_TEMPLATE_NO	A template number in the MTPL2 configuration file is invalid.	Read template number.	0
22 ERROR_INVALID_STANDARD	The name of a standard in the MTPL2 configuration template is invalid.	0	0
23 ERROR_BAD_SUERM_T	The value of the SUERM-T parameter in the MTPL2 configuration template is invalid.	Read SUERM-T value.	0
24 ERROR_BAD_SUERM_D	The value of the SUERM-D parameter in the MTPL2 configuration template is invalid.	Read SUERM-D value.	0

Error	Description	P1	P2
25 ERROR_BAD_TIN	The value of normal AERM threshold Tin parameter in the MTPL2 configuration template is invalid.	Read normal AERM threshold Tin value.	0
26 ERROR_BAD_TIE	The value of emergency AERM threshold Tin parameter in the MTPL2 configuration template is invalid.	Read emergency AERM threshold Tin value.	0
27 ERROR_BAD_ML	The value of the proving abort limit parameter in the MTPL2 configuration template is invalid.	Read proving abort limit value.	0
28 ERROR_BAD_T1_VALUE	The value of timer T1 in the MTPL2 configuration template is out of range.	0	0
29 ERROR_BAD_T2_VALUE	The value of timer T2 in the MTPL2 configuration template is out of range.	0	0
30 ERROR_BAD_T3_VALUE	The value of timer T3 in the MTPL2 configuration template is out of range.	Read timer value	0
31 ERROR_BAD_T4N_VALUE	The value of timer T4n in the MTPL2 configuration template is out of range.	Read timer value	0
32 ERROR_BAD_T4E_VALUE	The value of timer T4e in the MTPL2 configuration template is out of range.	Read timer value	0

Error	Description	P1	P2
33 ERROR_BAD_T5_VALUE	The value of timer T5 in the MTPL2 configuration template is out of range.	Read timer value	0
34 ERROR_BAD_T6_VALUE	The value of timer T6 in the MTPL2 configuration template is out of range.	Read timer value	0
35 ERROR_BAD_HWM_VALUE	The value of high watermark for the transmit buffer in the MTPL2 configuration template is out of range.	Read high watermark value	0
36 ERROR_BAD_LWM_VALUE	The value of low watermark for the transmit buffer in the MTPL2 configuration template is out of range.	Read low watermark value	0
37 ERROR_BAD_TF_VALUE	The value of timer Tf in the MTPL2 configuration template is out of range (only TTC).	Read timer value	0
38 ERROR_BAD_TS_VALUE	The value of timer Ts in the MTPL2 configuration template is out of range (only TTC).	Read timer value	0
39 ERROR_BAD_TO_VALUE	The value of timer To in the MTPL2 configuration template is out of range (only TTC).	Read timer value	0
40 ERROR_BAD_TE_VALUE	The value of timer Te in the MTPL2 configuration template is out of range (only TTC).	Read timer value	0
41 ERROR_INVALID_PO_FLAG	The value of the processor outage flag in the MTPL2 configuration template is invalid (only TTC).	0	0

Error	Description	P1	P2
42 ERROR_INVALID_JT_FLAG	The value of the Ericsson/JT.Q703 flag in the MTPL2 configuration template is invalid (only TTC).	0	0
43 MUX_CONFIG_FILE_OPEN_ERROR	An attempt to open the MUX config file has failed.	0	0
44 ERROR_MUX_CNF_FILE_VERSION	The value of the MUX config file version number is invalid.	Read version number.	0
45 ERROR_INVALID_NO_OF_TRUNKS	The number of trunks specified in the MUX configuration file is invalid.	Read number of trunks.	0
46 ERROR_INVALID_NO_OF_TS	A number of time slots specified in the MUX configuration file is invalid.	Read number of time slots.	0
47 ERROR_INVALID_TS_NO	A time slot number specified in the MUX configuration file is invalid.	Read time slot number.	0
48 ERROR_INVALID_TRUNK_NAME	A trunk name specified in the MUX configuration file is invalid.	0	0
49 MTP_FILE_CLOSE_ERROR	An attempt to close the Front-End MTP-L2 Interface main config file has failed.	0	0
50 MUX_FILE_CLOSE_ERROR	An attempt to close the MUX config file has failed.	0	0
51 ERROR_ISR_OPEN	An attempt to open a device driver port has failed.	errno (LSB WORD)	errno (MSB WORD)

Error	Description	P1	P2
52 ERROR_ISR_CLOSE	An attempt to close a device driver port has failed.	errno (LSB WORD)	errno (MSB WORD)
53 L2TEST_FILE_READ_ERROR	An error has occurred during the down load of the binary diagnostics test file on to the FPGA circuit.	errno (LSB WORD)	errno (MSB WORD)
54 DEVICE_RESET_ERROR	An temp to reset the device port has failed.	errno (LSB WORD)	errno (MSB WORD)
55 READ_SW_DOWNLOAD_STATUS_ERROR	The result of the reset of FPGA is different from the expected status result.	errno (LSB WORD)	errno (MSB WORD)
56 SW_DOWNLOAD_ERROR	Down load of a binary file to the FPGA circuit has failed.	0	0
57 ERROR_BAD_T7_VALUE	The value of timer T7 in the MTPL2 configuration template is out of range.	Read timer T7 value	0
58 ERROR_BAD_SIOS_TIMER_VALUE	The value of the SIOS sending timer in the MTPL2 configuration template is out of range (only TTC).	Read SIOS timer sending value	0
59 ERROR_BAD_TWFC_VALUE	The value of timer tWFC in the main configuration file of the FE-MTP-L2-IF is out of range.	0	0
60 GET_L1_ALARM_ERROR	An attempt to read the alarm from the board has failed.	0	0

Error	Description	P1	P2
61 MAX_NO_OF_BUFF_MES_REACHED	The amount of buffered messages have reached maximum, from now messages from the board will be discarded, until the number of buffered messages is less than maximum allowed.	0	0
62 ERROR_INVALID_ACTION	The action requested in a runtime reconfiguration order is invalid.	Action requested.	0
63 ERROR_NOT_ENOUGH_PARAMETERS	Front-End MTP-L2 Interface has been started with too few parameters.	Number of parameters including FE-MTP-L2-IF executable name.	0
64 ERROR_INVALID_HSN_NO	The value of the HSN read in the config file, received in an MM_ORDER_req or DL_STATUS_req is invalid or an internal error when resetting or reading statistics has occurred.	HSN	SDL
65 ERROR_INVALID_PARAM_ID	The value of the paramID received in an MM_ORDER_req (RTRECONF) is invalid.	Read paramID.	0
66 RTCNF_FORMAT_ERROR	The format of the received MM_ORDER_req (RTRECONF) is invalid.	0	0

Error	Description	P1	P2
67 ERROR_INVALID_PARAM_VALUE	The paramValue received in MM_ORDER_req (RTRECONF) is invalid.	0	0
68 ERROR_INVALID_TRUNK_NO	A trunk number received in the MM_ORDER_req (RNREMUX) is invalid.	Read source trunk number	Read destination trunk number.
69 RNMUX_INVALID_NO_OF_TS	A numberOfTS received in the MM_ORDER_req (RNREMUX) is invalid.	Read noOfTS	0
70 RNMUXCNF_FORMAT_ERROR	The format of the received MM_ORDER_req (RNREMUX) is incorrect.	noOfTs	Length-OfInfo
71 RNCNF_FORMAT_ERROR	The format of the received MM_ORDER_req (RNRECONF) is incorrect.	0	0
72 MT_DEVICE_READ_ERROR	This error code is only used during Module test. An attempt to read from a file simulating the device port has failed.	0	0
73 MT_DEVICE_EMPTY	This error code is only used during Module test. An attempt to read from a file simulating the device port has succeeded, but there was nothing to read.	0	0
74 IFEDBG_FILE_OPEN_ERROR	This error code is only used if the debug flag is on. An attempt to open the debug file has failed.	0	0
75 ERROR_INVALID_ORDER	The orderID in the MM_ORDER_req primitive is invalid.	Read orderID	0

Error	Description	P1	P2
76 ERROR_ORDER_LENGTH	The size of data in the MM_ORDER_req is invalid.	Read size	0
77 FALC_SETUP_FILE_CLOSE_ERROR	An attempt to close the FALC register setup file has failed.	0	0
78 FILE_READ_ERROR	An attempt to read from a binary file to down load has failed.	errno (LSB WORD)	errno (MSB WORD)
79 DMA_WRITE_ERROR	A DMA write transfer has failed.	errno (LSB WORD)	errno (MSB WORD)
80 DMA_READ_ERROR	A DMA read transfer has failed.	errno (LSB WORD)	errno (MSB WORD)
81 DEVICE_IOCTL_ERROR	An IOCTL() towards the device driver has failed.	0	0
82 MT_FILE_WRITE_ERROR	This error code is only used during Module test. An attempt to write to a file simulating the device port has failed.	0	0
83 INVALID_SOURCE_TRUNK_NAME	A source trunk name in the mux configuration could not be recognized.	0	0
84 READ_DEVICE_VERSION_ERROR	An attempt to read the device version number has failed.	errno (LSB WORD)	errno (MSB WORD)

Error	Description	P1	P2
85 ERROR_TDMA_EXP_BUFFER_EMPTY	The timer tDMAW has expired, but the DMA buffer is empty. An error case, which normally should not happen.	0	0
86 TDMA_TIMER_IN_WRONG_STATE	The timer tDMAW has expired in a wrong state.	0	0
87 ERROR_BAD_TDMAW_VALUE	The tDMAW value in the configuration file is wrong.	0	0
88 ERROR_START_THREAD_FAILED	An attempt to start the Rx thread has failed	errno (LSB WORD)	errno (MSB WORD)
89 DMA_WRITE_SIZE_ERROR	The DMA transmit buffer 's pointers has been corrupted. the data size is negative or the size is not valid.	DMA data size	
90 ERROR_CREATE_EVENT_HANDLE	An attempt to create a Windows NT Event to be related to an overlapped ReadFile() is failed (only happens in Windows NT environment)	errno (LSB WORD)	errno (MSB WORD)
91 EIN_IFE_ERROR_XMALLOC_DMA	An attempt to allocate memory for the DMA buffer on the host failed.	errno (LSB WORD)	errno (MSB WORD)
92 EIN_IFE_MSU_FORMAT_ERROR	A DL_MSU_REQ with corrupt length information has been detected.	0	0
93 DESTINATION_TRUNK_NAME_ERROR	A destination trunk name in MUX config file points to another cards subchannel or has an not regonized name.	0	0

Error	Description	P1	P2
94 ERROR_INVALID_BOARD_TYPE	The type of SS7CC in the Front-End MTP-L2 Interface configuration file could not be recognized.	0	0
95 ERROR_INVALID_CLOCK_REFERENCE	The name of the clock reference for the SS7-board is not regonized.	0	0
96 ERROR_INVALID_CLOCK_SOURCE	The name of the clock source is invalid.	0	0
97 PCM_CLOCK_MODE_ERROR	Clock mode for PCMA or PCMB is not valid.	0	0
98 ERROR_INVALID_SC_BUS_CLOCK_SPEED	The SC-bus clock speed is invalid.	0	0
99 ERROR_INVALID_SC_CLOCK_MODE	The SC-bus clock mode is not valid.	0	0
100 ERROR_INVALID_SREF8K_MASTER_VALUE	The SREF8K option is invalid.	0	0
101 ERROR_MUST_BE_SAME_STANDARD	The configuration of the HSNs in the MTP-L2 configuration does not use the same standard.	0	0

Error	Description	P1	P2
102 MULTIPLE_TEMPLATE_DEFINITION_ERROR	Multiple definitions of configuration entity, two configuration templates with same number.	template number	0
103 MULTIPLE_SDL_DEFINITION_ERROR	Multiple definitions of configuration entity, the same HSN,SDL pair define twice.	HSN	SDL
104 FALC_REG_SETUP_FILE_OPEN_ERROR	The FALC register setup file could not be opened.	0	0
105 ERROR_FALC_SETUP_CNF_FILE_VERSIONS	The FALC setup file version is wrong.	Read version number.	0
106 FALC_SETUP_BOARD_TYPE_ERROR	The board type specified in the FALC setup file could not be recognized.	0	0
107 IFE_SS7CC_REPORT_ERROR	The reported number of bytes written to the board is not valid.	0	0
108 ERROR_BAD_TWFNB_VALUE	The tWFNB value in the configuration file is wrong.	0	0
109 ERROR_INVALID_BIT_RATE	The bit rate specified for T1 in the configuration file is wrong.	0	0
110 ERROR_INVALID_LINE_CODING	The line coding specified for T1 in the configuration file could not be recognized.	0	0

Error	Description	P1	P2
111 ERROR_INVALID_FRAMER_MODE	The framer mode specified for T1 in the configuration file could not be recognized.	0	0
112 ERROR_INVALID_TRANSMISSION_SYSTEM	The transmission system type specified in the configuration file could not be recognized.	0	0
113 ERROR_INVALID_LINE_IF_MODE	The line interface mode specified in the configuration file could not be recognized.	0	0
114 ERROR_TRANSMISSION_SYSTEM_MISMATCH	The transmission system specified in the FALC configuration is different from the one specified in the FALC register setup file.	0	0
115 ERROR_REGISTER_ADDRESS_TOO_HIGH	A register address specified in the FALC register setup file is too high.	0	Number of register addresses read.
116 ERROR_REGISTER_VALUE_TOO_HIGH	A register value specified in the FALC register setup file is too high.	0	Number of register values read.
117 TWFNB_RECEIVED_WITH_EMPTY_BUFFERS	The timer tWFNB has expired without any buffered messages found.	0	0

Error	Description	P1	P2
118 ERROR_BAD_TA_VALUE	The value of timer Ta in the MTPL2 configuration template is out of range (only TTC).	Read timer value	0
119 IFE_NOW_EXIT_ON_ERROR	A fatal error has occurred and the Front-End MTP-L2 Interface will exit. Two sysLogs are done before this sysLog, this is to be able to see the last tx event and the last rx event.	0	0

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