EUROPEAN SPACE AGENCY

ESRIN

ESRIN ERS CENTRAL FACILITY

FILE TRANSFER

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AMENDMENT CONTROL

ISSUE	REV.	DATE	PURPOSE	SECTION	ACTION
Draft	0	88/09/30	First Draft	All	New
1	0	88/11/21	First Issue	Annex I	New
1	1	88/12/20	Added the note on file type	2.1	Modif.
1	2	89/05/25	Added list of FTPs; fully revised file description	All	Modif.
1	3	89/09/28	Specified that cyclic counter is per file type.	2.2.4	Modif.
			Specified that fixed portion and variable portion are two separate records.	2.2.3	Modif.
1	4	91/01/15	**Major Changes:** Removed TCP/IP; described limitations in the use of FTSV; defined sender responsibilities.	2.1	Revised
			Appl. Data Records can also be variable length; defined record attributes.	2.2.3	Revised
			Defined Cyclic Counter overflow through zero; Cyclic Counter per file type only as an option.	2.2.4	Revised
			Described re-transmission implementation at EECF.	2.3	Revised
1	5	91/04/25	**Major Changes:** FTP better defined;	2.1.1	Revised
			Transmissiom Methods;	2.1.2	New
			LBR FDP transmission better defined.	2.2.2	Revised
2	0	93/12/15	All changes highlighted by a vertical bar, except those related to change in terminology: ERS-1 becoming ERS-1/2, and 'E1' becoming 'E1'|'E2'.	Some	Revised

Major changes:

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 SCOPE 1
1.2 APPLICABLE DOCUMENTS 1
2 FILE TRANSFER 2
2.1 FILE TRANSFER PROTOCOL 2
2.1.1 Available Protocols 2
2.1.2 Transmission Methods 3
2.1.2.1 Introduction 3
2.1.2.2 FTSV (DEC/DEC) 3
2.1.2.3 FTAM (DEC/DEC) 4
2.1.2.4 FTAM (DEC/SUN) 4
2.1.2.5 FTAM (DEC/Others) 5
2.1.2.6 TCP/IP 5
2.2 FILE STRUCTURE 6
2.2.1 File Types 6
2.2.2 Fast Delivery Products 6
2.2.3 Monitor and Control Files 6
2.2.4 File Name 8
2.3 DIRECTORY SYSTEM 9
. 9
. 9
ANNEX I: INTERFACE DATA FORMATS 1
1 FIXED_PORTION 1

ACRONYMS AND ABBREVIATIONS

DEC	Digital Equipment Corporation
EECF	ESRIN ERS Central Facility
EPO	Earthnet Programme Office
ERS-1	European Remote Sensing Satellite
ESA	European Space Agency
ESOC	European Space Operations Centre
ESRIN	European Space Research Institute
FTP	File Transfer Protocol
FTSV	File Transfer Spooler for VMS
FDP	Fast Delivery Product
ISS	Interface Subset
LBR	Low Bit Rate
PAF	Processing and Archiving Facility
PTI	PAF Telecommunication Interface
VAX	Virtual Address eXtension
VMS	Virtual Memory System (operating system for VAX computers)

1 INTRODUCTION

1.1 SCOPE

This document describes the structure of files and the method for file exchange between the ESRIN ERS Central Facility (EECF) and the Processing and Archiving Facilities (PAFs) and the Ground Stations of the ERS-1/2 Ground Segment.

1.2 APPLICABLE DOCUMENTS

A-1	ER-IS-EPO-GS-0201	ERS-1 Ground Stations Products Specification
A-2	ER-IS-EPO-GU-0102	ERS-1 Central User Service Data Structures

2 FILE TRANSFER

2.1 FILE TRANSFER PROTOCOL

2.1.1 Available Protocols

EECF transmits and receives files (all kinds of, including binary ones) under the control of a File Transfer Protocol (FTP), which takes care of:

- safe file transfer over the network with automatic rerouting,
- remote application notification (if applicable),
- access security,
- "no delivery" notification,
- saving of transmitted files.

At EECF the following FTPs are available:

a)-FTAM, for transfer of files even between different computer brands;
b)-FTSV (File Transfer Spooler for VMS), only for DEC to DEC communications;
c)-File Assembly/Disassembly (FAD), custom developed protocol, only for ESA ground stations interface (except Kiruna);
d)-WMO-X25 message sender, custom developed and only for Meteorological community interface;
e)-File transfer over TCP/IP, for transfer of files even between different computer brands.

The entities linked to EECF (except ESA stations) can choose one of the protocols a), b) or e) for file exchange.

To be noted that FTSV uses DECnet and therefore limits the DECnet area node addressing. FTSV can be used from EECF only towards computers behaving as DECnet dedicated "end nodes" (not performing any additional routing).

Current DEC implementation of FTAM does not handle checkpoints (relevant for long files) nor re-transmissions (to recover from failures). At present DEC FTAM handles line breaks only through the functions provided by the lower layers (OSAK and VOTS), dealing properly only with line breaks lasting less then about 1 minute. Therefore, in order to ensure file transmission, an application layer should automatically drive FTAM to re-transmit the file in case of transmission failures (or an equivalent manual procedures must be defined and performed at the transmission side).

In case a remote computer is connected to Internet, care should be taken in order to avoid unathorised access to the EECF operational files.

When a file is ready, the sender transmits it to the recipient, immediately or during an agreed time window. The sender is responsible for the successful transmission. In case of unsuccessful transmission, the sender will retry a number of times and then a manual procedure for solving the problem will be triggered. In case of failure of the link, the sender will retry over an alternate routing.

2.1.2 Transmission Methods

2.1.2.1 Introduction

All the files exchanged between EECF and PAFs or Ground Stations contain variable length records (see File Structure Section). The DEC Operating System handles variable length record files keeping track of the record length information. In particular, when the file attributes, as in the EECF case, are:

FORMAT	Variable
CARRIAGE_CONTROL	Carriage Return

each record in the file is preceded by two bytes, containing in binary the length of the record. These bytes are not seen from the applications and are fully under Operating System control.

The record length is as well under full control of the DEC FTPs during transmissions. The record length information is used by FTSV or FTAM to reconstruct at the other end a file with the same characteristics.

The next chapters describe in detail what happens in the transfer of files using FTSV or FTAM.

2.1.2.2 FTSV (DEC/DEC)

FTSV operates only between DEC computers and makes use of DECnet. It requires strict control of the DECnet node address. Any computer exchanging files via FTSV with EECF will become a node member of the EECF private DECnet network. Therefore all its DECnet links will be dedicated completely to EECF connection (no other DECnet communication with other nodes, remote or local, possible). This means also that its DECnet address will be assigned by EECF Network Management in line with the EECF policy for area numbers and that it must be set-up as a DECnet end node.

The major advantage of FTSV is the reliability of transfer, since it implements checkpoint-restart (in case of line break long files are re-transmitted from the last checkpoint) and retrials (even for days).

FTSV reconstructs the files at the receive end with the same layout and attributes of the source. FTSV transfers with no problem both ASCII and binary files.

2.1.2.3 **FTAM (DEC/DEC)**

When transmitting a file, FTAM looks at the file attributes in order to decide whether to use FTAM-1, FTAM-2 or FTAM-3 for the transfer. These three transfer methods are for:

FTAM-1	unstructured text
FTAM-2	sequential text
FTAM-3	unstructured binary

When the files attributes are:

FORMAT	Variable
CARRIAGE_CONTROL	Carriage Return

FTAM chooses FTAM-2 for the transmission and reconstructs the record structure at the receive end.

While preliminary tests had shown no transfer problem also for binary files, further tests with more complex files have shown that current DEC implementation of FTAM-2 is not suitable to transfer safely them. Therefore for binary files it is necessary to enforce the use of FTAM-3. This can be done converting, before FTAM protocol activation, the files attributes (for example using a DEC FDL CONVERT command) from:

FORMAT	Variable
CARRIAGE_CONTROL	Carriage Return

to:

FORMAT	Undefined
CARRIAGE_CONTROL	None

This change in attributes corresponds to the removal from the file of the two binary bytes preceding each record and containing the record length. The resulting file will just be a continuous string of bytes with no special separator. Since in this way the record structure is lost, it will be necessary to read the file with a mask (defining the length of each record type and the sequence of record types) at the receive side.

2.1.2.4 **FTAM (DEC/SUN)**

SUN computers are based on the UNIX Operating System. UNIX does not support variable length records, but handles files with "Line Feeds" as record separators (a "Line Feed" is present at

the end of each record). Therefore it should be possible to transfer and convert ASCII files between the two environments, maintaining the separation in records.

Due to the current FTAM implementation, binary files should be transferred in any case via FTAM-3 and read via a mask at the receive end.

Unfortunately the current SUN and DEC implementations of FTAM are incompatible. Therefore, until release of a new product, FTAM cannot be used at all between DEC and SUN.

2.1.2.5 **FTAM (DEC/Others)**

FTAM aim is to permit transfer of files between different computer brands. No experience has been made so far in ESRIN on FTAM transfer between machines different from DEC and SUN. Anyway, considering the difficulties encountered with these two implementations, any new product should be carefully evaluated.

In setting-up a transfer via FTAM between DEC and another computer brand (not DEC nor SUN), the method permitting to transfer variable length records should be used, if existing, in order to reduce overheads. If this method does not exist, FTAM-3 should be used, in order to transfer the files (ASCII or binary) as a continuous string of data (no separator or record length field) and reading them through a mask at the destination.

2.1.2.6 **TCP/IP**

The file transfer through TCP/IP allows computers of many different brands (DEC, SUN, IBM, ...) to exchange binary or ASCII files.

Exchange of operational files with EECF through TCP/IP shall occur over an X.25 link (TCP/IP will be encapsulated into X.25 packets).

The remote computer can also be member of the Internet Network (meaning that it can be reached also from any other computer connected to Internet). In such a case, at the remote computer, all the necessary measures shall be taken in order to avoid unathorised intrusion into the EECF connection or access to the EECF operational files. Should security measures not be adequate, the connection will be interrupted until security is restored.

2.2 FILE STRUCTURE

2.2.1 File Types

Two types of files travel through the ERS-1 ground segment:

a)-Fast Delivery Products (FDPs) generated at the stations;
b)-Monitor and Control Files (MCFs) to/from ground segment facilities.

2.2.2 Fast Delivery Products

The LBR FDPs are described in document A-1. All the products are distributed to the Product Control Service (PCS). The UWI, UWA and URA FDPs are distributed to Meteorological Organisations, PAFs and selected entities.

The distribution to Meteorological Organisations, for their own use and further routing to other selected entities (e.g. ECMWF), is performed after their encoding into the World Meteorological Organisation BUFR94 format (binary messages) and injecting them into the GTS network through the WMO-X25 custom FTP.

The distribution to PAFs and selected entities is performed after elimination of the dummy UWI products, transmitting files through FTSV or FTAM. Several FDPs of the same type may be grouped in one file. The number of FDPs per file is variable and is determined only by the sizes of the FDP and of the containing file. Files at orbit crossing can contain products related to both orbits. These files do not include the file_descriptor used in the MCFs. LBR FDPs longer than 16384 bytes will be split into multiple records of 16384 bytes, except (eventually) last one, which will be as short as necessary. Therefore the LBR FDPs are stored in EECF for transmission with the attributes:

FORMAT	Variable
CARRIAGE_CONTROL	Carriage Return

The name of these files will end with CF (UWICF, UWACF and URACF). It will be possible to request re-transmission of these files (at present within 6 hours), using the ISS interactive facilities (logon into ISS, look at the list of available files, request re-transmission).

2.2.3 Monitor and Control Files

The MCFs contain a variable number of records of the same type (application_data_records), preceded by a file_descriptor, which is made of a fixed_portion and a variable_portion, as shown below in the figure and in the format layout:

file					
file_descriptor		application_data_records			
fixed_portion	variable_portion	record 1	record 2	***	record n

The fixed_portion and the variable_portion are two separate records.

MCF FORMAT LAYOUT:

```
-file_descriptor
  .fixed_portion
    *file_name
      -file_identifier
        .file_type (2 pairs of 2 characters)
        "."
      -generation date (YYMMDD)
      -originator (2 characters)
      -destination (2 characters)
      -cyclic counter (4 digits)
      -"."
      -satellite (E1 or E2)
    *generation_time (HH:MM:SS)
  .variable_portion (only if necessary and one layout per
   file_type)
-application_data_records (fixed or variable length, one layout
 per file_type)
```

The variable_portion is present only if necessary. If present, it has one specific, pre-defined layout for each file type. It contains all the information common to all the records in the file.

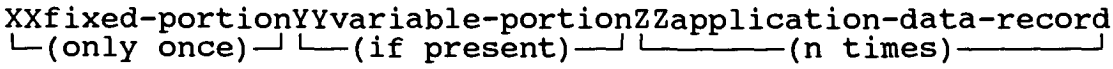
The application_data_records are fixed or variable length records. In the case of fixed length records, each record has one specific, pre-defined, constant layout for each file type.

Only records of the same type are included in a file.

Since in all MCFs exists the fixed portion (usually with a length different from the one of the application data records) MCFs are stored on disk, ready for transmission, with the following DEC attributes:

Record Format = Variable Length
Record Carriage Control = Carriage Return

It must be noted that these attributes generate files with variable length records preceded by a two bytes field containing the length of the next record in binary (and not delimited by the Carriage Return character, as it could be expected). Therefore the graphic representation of the file on disk is:



where XX, YY and ZZ contain the length in binary of the next record.

2.2.4 File Name

Each file, of the FDP or MCF type, has a unique name assigned by the originating facility according to the file_name layout described within the MCF format in section 2.2.3.

X_FILE_ID in document A-2 lists all the valid file_identifiers. This file_identifier is used both for FDPs (with names from 3 to 5 characters long) and MCFs (with 4 character names). The file_identifier is padded to 5 characters by the underscore sign ("_"). The leading characters of the file_identifier can be as listed in X_FILE_GROUP in document A-2.

Originator and destination can be as listed in X_FACILITY_ID in document A-2.

The Cyclic Counter is incremented at each new file generation and wraps around through zero at overflow. The counter should be per file type (separate counters per file types and not a single counter for the whole system), so that new files of the same type are assigned sequentially increasing counter values.

As an example of a valid MCF file name, the file REAR_901220DPEC0001.E1 is related to a file of reports (RE) on archiving activity (AR), dated 1990 December 20, from the German PAF (DP) to the EECF-CUS system (EC), having the sequential number 1 (0001) and related to the ERS-1 mission (E1).

Examples of valid FDP file names are:

UWI__911105GSEE0028.E1
UWAC_920326MSEE0632.E1
UWAND910518FSEE0005.E1

2.3 DIRECTORY SYSTEM

Each file in mass storage is identified through a directory where the file name with the layout defined in section 2.2.4 is stored. File names are entered into the directory after successful completion of file storing.

MCFs are saved at the sender side for at least 7 days, in order to permit re-transmission on request after line breaks or receiving system unavailability. The addressee must be able to read all the directories of his own concern, compare the list of files available with the list of files received and request file re-transmission by name.

The above is implemented at EECF through the menu structure of the Interface Sub-Set (ISS). The user will logon onto ISS, read through the menu structure the files available to him and request re-transmission of the relevant ones.

After the retention period is expired, the sending system must delete the directory entry before cancelling the file, in order to ensure consistency.

ANNEX I: INTERFACE DATA FORMATS

1 **FIXED_PORTION**

NO.	NAME	OFFST	LENGTH	TIMES	T	DESCRIPTION
			30			*** TOTAL BYTES
1.0	X_FILE_NAME	0	22			File Name
2.0		22	8			GENERATION TIME:
2.1		22	2		N	Hours (HH = "00" to "23")
2.2		24	1		A	Separator = ":"
2.3		25	2		N	Minutes (MM = "00" to "59")
2.4		27	1		A	Separator = ":"
2.5		28	2		N	Seconds (SS = "00" to "59")