1. Publication NO INPE-4032-RTR/092	2. Version	3. Date Nov., 1986	5. Distribution ☐ Internal ☐ External
4. Origin DCA/DIA	Program SUBORD		☒ Restricted

8. Title INPE-4032-RTR/092 ON BOARD COMPUTER TELECOMMAND AND STORAGE TELEMETRY FORMATS	10. NO of pages: 10
	11. Last page: 6
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14. Abstract/Notes

This document presents the formats of the Telecommand (TC) and Telemetry (TM) messages to be handled by the On Board Computer of the first Brazilian Complete Space Mission Satelite.

It also describes the structure Operation Process Packet and Execution Data Packtes that are data fields of the TM and TC messages.

15. Remarks

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LIST OF FIGURES

ON BOARD COMPUTER TELECOMMAND AND STORAGE TELEMETRY FORMATS

This document presents the formats of the TC and TM messages to be handled by the On Board Computer of the On Board Supervision Subsystem (OBS).

1 - TC FORMAT

The TC message to be received by the On Board Computer consists of a string up to 254 24-bit serial load commands, as presented in figure 1.

|←———————————— 3 octets ————————————→|

0	OCTET 0	OCTET 1
1	OCTET 2	OCTET 3
. . .	. . .	. . .
n - 1	OCTET 2n-2	OCTET 2n-1
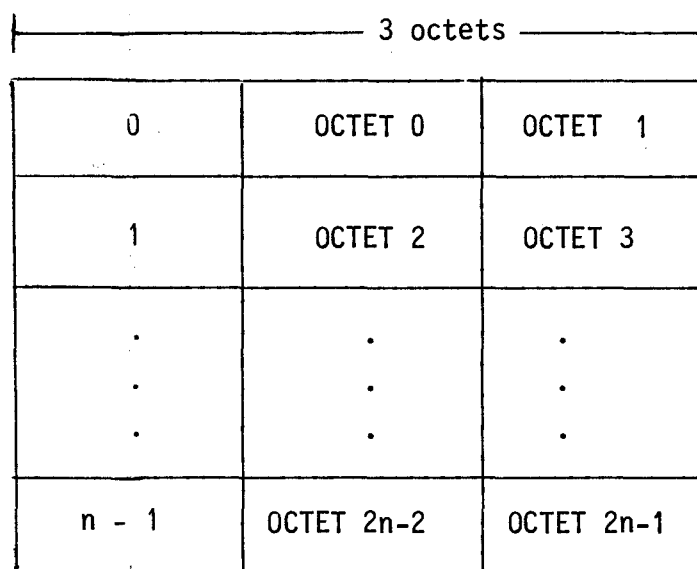
where $11 \leq n \leq 253$

Fig. 1 - TC format

The first octet of the 24-bit serial load commands specifies the sequence of the message. The message sequence number begins with zero, increases sequencially up to n-1 and always finishes with 255.

The second and third octets of the ith 24-bit serial load commands contain the $(2\ i)^{th}$ and $(2i + 1)^{th}$ octet of Operation's Process Packet (PPO). For this space mission, the PPO to be addressed to the On-Board Computer Subsystem has a variable size which is to be limited between 24 to 508 octets. The PPO format is presented in Section 3.

2 - STORAGE TM FORMAT

The Storage TM Format consists of 128 octets telemetry frames, as presented in Figure 2, according to the ESA (Ref. PPS-46 ESA PCM) Telemetry Standard (April 78).

The first frame contains Real Time Telemetry specified in the Applicable Document - B (AD-B), while from frame 1 to 5 the field between octet nº 5 to octet nº 112 is reserved to segments of PPO's. For this space mission, the size of the telemetry PPO will be limited to 540 octets. When the size of the PPO is less than 540 octets, the remaining octets of the reserved area are filled with a bit string of a alternating binary, zeros and ones, beginning by a zero.

SYNC (1 oct)	SYNC (1 oct)	FRAME # AND MODE (1 oct)	FORMAT #	REAL TIME TELEMETRY (108 oct)	SPARE (14 oct)	CRC (1 oct)	CRC (1 oct)
"	"	1 "	"		"	"	"
"	"	2 "	"	RESERVED FOR PPO'S (540 OCTETS)	"	"	"
"	"	3 "	"		"	"	"
"	"	4 "	"		"	"	"
"	"	5 "	"		"	"	"

|———————————— 128 octets ————————————|

Fig. 2 - Storage TM format

3 - THE PPO STRUCTURE

The PPO structure is presented in Figure 3.

PRIMARY HEADER (16 OCTETS)	ANCILLARY DATA HEADER (OPTIONAL) (UP TO 64 OCTETS)	OCTET STUFFING (CONDITIONAL) (1 OCTET)	DATA FIELD (VARIABLE)	ERROR CONTROL (2 OCTETS)

$$\longmapsto \text{UP TO} \begin{Bmatrix} 508 \text{ octets for TC} \\ 540 \text{ octets for TM} \end{Bmatrix} \longmapsto$$
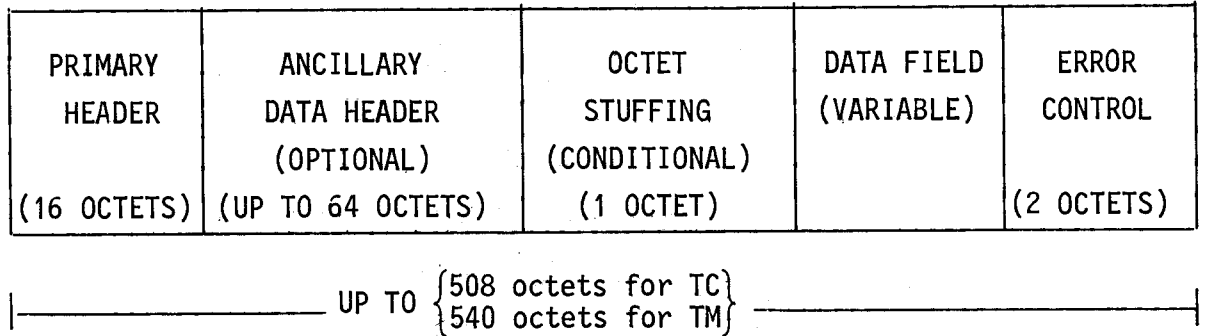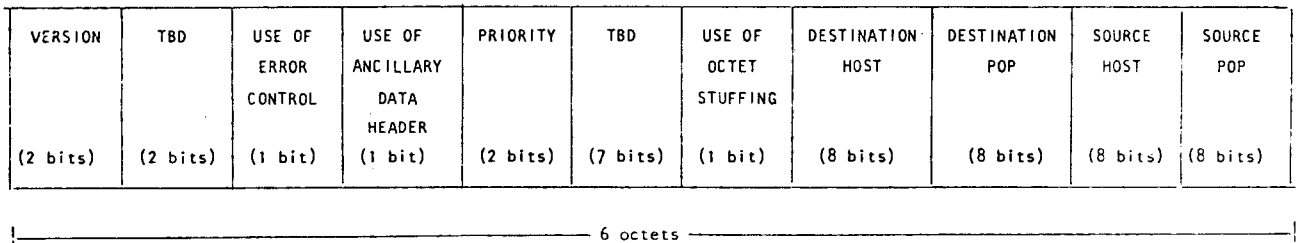
Fig. 3 - PPO structure

The PPO Primary Header consists of an Identification Field (6 octets) and an Operational Control Field (10 octets). They are described, in detail, in Figure 4 and 5.

IDENTIFICATION FIELD

VERSION (2 bits)	TBD (2 bits)	USE OF ERROR CONTROL (1 bit)	USE OF ANCILLARY DATA HEADER (1 bit)	PRIORITY (2 bits)	TBD (7 bits)	USE OF OCTET STUFFING (1 bit)	DESTINATION HOST (8 bits)	DESTINATION POP (8 bits)	SOURCE HOST (8 bits)	SOURCE POP (8 bits)

$\longmapsto$ 6 octets $\longmapsto$

* POP means Operational Process

Fig. 4 - PPO Primary Header

OPERATIONAL CONTROL FIELD

MISSION ID	ROUTE ID	OPERATION ID	OPERATIONAL OBJECTIVE ID	OPERATIONAL STAGE ID	PACKET SERIAL NUMBER	PPO TOTAL SIZE	NUMBER OF PDEs IN THE SEQUENCE	CHECKSUM OF THE PPO PRIMARY HEADER
(8 Bits)	(8 Bits)	(8 Bits)	(8 Bits)	(8 Bits)	(8 Bits)	(16 Bits)	(8 Bits)	(8 Bits)

|————————————— 10 octets —————————————|

* PDE means Execution Data Packet

Fig. 5 - PPO Primary Header.

The Ancillary Data Header is described in Figure 6.

VERSION (2 bits)	ANCILLARY DATA HEADER SIZE (6 bits)	TYPE (8 bits)	REAL-TIME DATA INSERTION (up to 62 octets)

|————————————— Up to 64 octets —————————————|

Fig. 6 - PPO Ancillary Data Header.

The data filled contains one or more Execution Data Packets (PDE's), whose structure is presented in Figure 7.

EXECUTION MODE HEADER (6 octets)	PRESENTATION HEADER (OPTIONAL) (3 octets)	FILE HEADER (OPTIONAL) (2 octets)	ANCILLARY DATA HEADER (OPTIONAL) (up to 64 octets)	OCTET STUFFING (CONDITIONAL) (1 octet)	DATA FIELD (variable)

Fig. 7 - PDE structure.

The Execution Mode Header consists of a Packet Identification Field (1 octet) and an Execution Control Field (5 octets), which are described in Figure 8 and 9 , respectively.
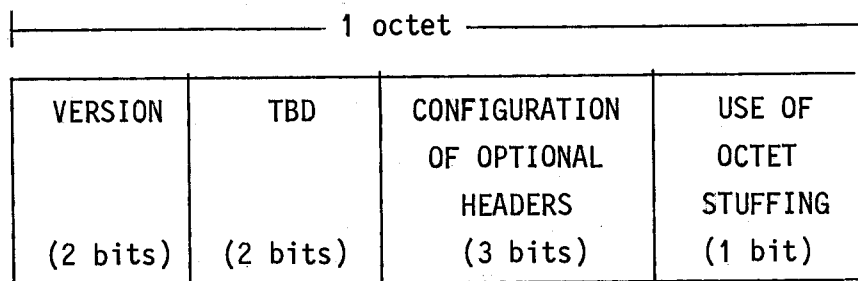
|←————————— 1 octet ——————————→|

VERSION (2 bits)	TBD (2 bits)	CONFIGURATION OF OPTIONAL HEADERS (3 bits)	USE OF OCTET STUFFING (1 bit)

Fig. 8 - Package Identification Field.

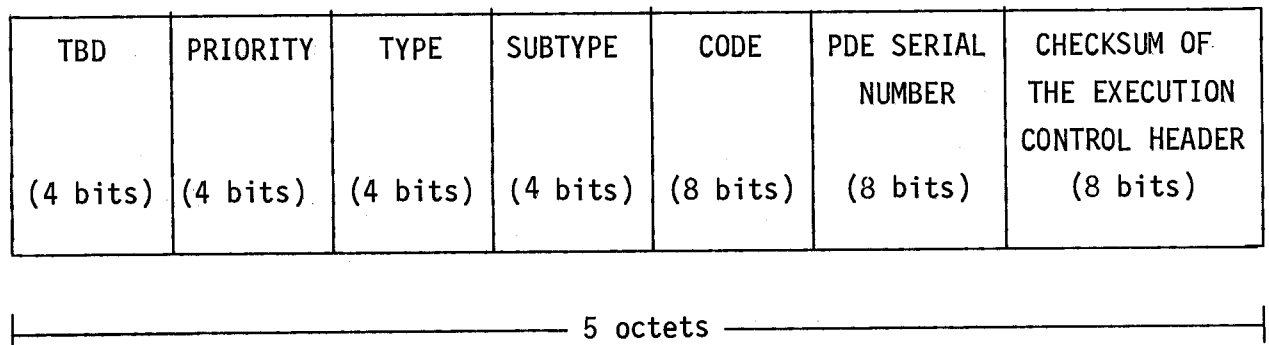| TBD (4 bits)	PRIORITY (4 bits)	TYPE (4 bits)	SUBTYPE (4 bits)	CODE (8 bits)	PDE SERIAL NUMBER (8 bits)	CHECKSUM OF THE EXECUTION CONTROL HEADER (8 bits)

|←————————————————— 5 octets —————————————————→|

Fig. 9 - Execution Control Field.

The Presentation Header describes how the Data Field is structured and it is presented in Figure 10.

DATA FIELD LENGH (16 bits)	TBD (2 bits)	DATA TYPE (2 bits)	PRESENTATION FORMAT (4 bits)

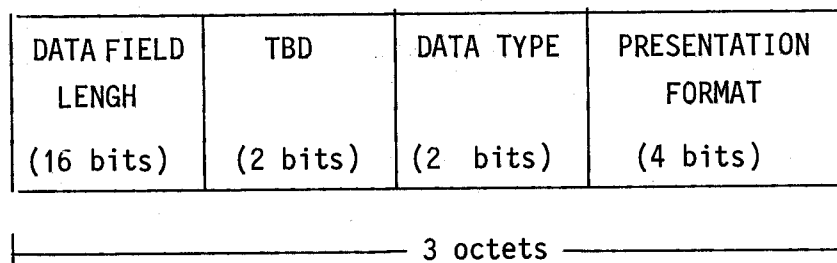|←————————————— 3 octets —————————————→|

Fig. 10 - PDE Presentation Header.

The File Header provides information to store to or retrieve from the associated file system and the header structure is presented in Figure 11.
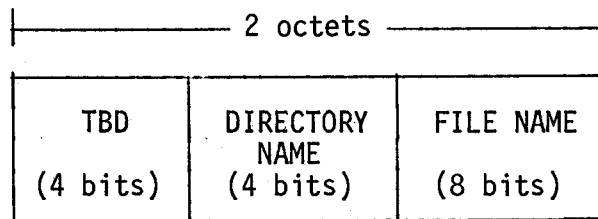
|←——————— 2 octets ———————→|

TBD (4 bits)	DIRECTORY NAME (4 bits)	FILE NAME (8 bits)

Fig. 11 - PDE File Header.

The PDE Ancillary Data Header is similar to that of the PPO, which is described in Figure 6 .

PROPOSTA PARA PUBLICAÇÃO

DATA
22.07.86

IDENTIFICAÇÃO

TÍTULO

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REVISÃO TÉCNICA

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APROVADO: ☒ SIM ☐ NÃO ☐ VER VERSO
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REVISÃO DE LINGUAGEM

Nº: 330

PRIORIDADE: 1

DATA: 30.07.86

REVISADO ☐ COM ☐ SEM CORREÇÕES ☐ VER VERSO

POR: Marie do Carmo S. Soares

4-8-86
DATA / ASSINATURA

DATILOGRAFIA

O(S) AUTOR(ES) DEVEM MENCIONAR NO VERSO, OU ANEXAR NORMAS E/OU INSTRUÇÕES ESPECIAIS

RECEBIDO EM: Julho/86

CONCLUÍDO EM: Julho/86

DATILÓGRAFA: Ana Maria /R.388

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FAVORÁVEL: ☐ SIM ☐ NÃO ☐ VER VERSO

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PUBLICAÇÃO: 4085RTR/092 PÁGINAS: _____ ÚLTIMA PÁGINA: _____

CÓPIAS: _____ TIPO: _____ PREÇO: _____