# TITLE:  ENVISAT-1 PRODUCTS SPECIFICATIONS

# VOLUME 6: LEVEL 0 PRODUCTS SPECIFICATION

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# CHANGE RECORD

| ISSUE | REVISION | DATE | CHANGE STATUS | ORIGIN |
|---|---|---|---|---|
| 1 | A | 12/01/96 | Issue 1 | |
| 1 | B | 16/02/96 | SCR #16, CR #16<br>Issue 1, Revision B<br><br>Reason for Change:<br><br>Updated to reflect information in PO-TN-ESA-GS-0381 and to address RIDs of Feb. 2/96 pertaining to the Level 0 structure.<br>MPH, SPH, DSD, and DSR structures modified.<br><br>Table added showing generalized Level 0 product structure.<br><br>RIDs Addressed:<br><br>ESA/0001:   FEP header defined<br>ESA/0002:   PF-Host time stamp clarified<br><br>ESA/0004:   Processing PCD added<br>ESA/0006:   AF PCD ADS and DSD added<br><br>ESA/0007:   page A-3 updated<br>ESA/0008:   page B-3 updated<br><br>ESA/0009:   Table 8.1.1 modified<br>ESA/0011:   TBD changed to Range/ Doppler<br><br>ESA/0013:   FEP header defined<br>ESA/0014:   Table 8.4.7.4-2 corrected<br><br>CSF/1:   filename in MPH corrected<br>CSF/2:   page A-3 updated | |

| ISSUE | REVISION | DATE | CHANGE STATUS | ORIGIN |
|---|---|---|---|---|
| | | | CSF/3: MPH PCD information updated | |
| | | | CSF/5: DSD added to Level 0 SPH | |
| | | | CSF/6: Section on AATSR updated and re-issued | |
| | | | CSF/8: AATSR_O Summary Sheet updated | |
| 1 | C | 04/04/96 | SCR #38, CR #38 Issue 1, Revision C<br><br>Reason for Change:<br><br>Updated Sections 1-6, 17 and Annex A to reflect changes discussed at the Products Review Meeting #1, March 5-8, 1996, as per action item "AI MDA 6 April 96" from PO-MN-ESA-00416, Pg. 35. | Products Review Meeting #1 |
| 2 | A | 20/05/96 | SCR #71, CR #71 Issue 2<br><br>Separate volume created.<br><br>New product list added.<br><br>Updated product names.<br><br>Moved Orbit State Vector and Time Conversion files descriptions to Volume 16.<br><br>FEP header updated. | |
| 2 | B | 02/09/96 | SCR #102, CR #102 Issue 2, Revision B<br><br>Reason for Change:<br><br>Level 0 SPH updated. FEP Annotations updated. | Products Review Meeting #2 |

| ISSUE | REVISION | DATE | CHANGE STATUS | ORIGIN |
|---|---|---|---|---|
| 3 | A | 10/02/97 | SCR #133, CR #133<br>Issue 3<br><br>Reason for Change:<br><br>Updated due to ESA RIDs received 06/01/97 (fax DPD/JMJ/ENV, 0021/97). | ESA RIDs |
| 3 | B | 19/06/97 | SCR #169, CR #169<br>Issue 3, Revision B<br><br><br>Reason for Change:<br><br>Minor clarifications. | Products Review Meeting #3 |
| 3 | C | 16/10/98 | SCR #218, CR #218<br>Issue 3, Revision C<br><br>Reason for Change:<br><br><br>Updated for the following SPRs:<br>SPR-42000-104-CSF | |

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## REGISTER OF CHANGES

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# LIST OF TABLES

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# 6 LEVEL 0 PRODUCTS SPECIFICATION

The Level 0 product for all instruments, plus Housekeeping and Telemetry data, share a common format. The details of this format is defined in Section 6.1. The auxiliary data files used to produce the Level 0 product are defined in Section 6.2.

The Level 0 product contains Annotated Instrument Source Packets (AISPs). These are Instrument Source Packets as received from the instrument, with a small header attached by the Front-End Processor (FEP). In addition to the AISP, each MDSR of the Level 0 product contains a time stamp in MJD 2000 format which gives the on-board sensing time of that ISP which it contains (one MDSR per AISP).

The MDSRs within the Level 0 product are:

- demultiplexed per instrument (and per mode for some instruments);
- in ascending chronological order;
- without overlap between the real time and on-board recorder;
- without obsolete data from the on-board recorded data;
- stored on a computer-compatible format, media and interface.

The Level 0 product may be Unconsolidated or Consolidated. The Unconsolidated product is the Level 0 product which is produced in NRT in the PDHS according to the acquired downlink instrument data segment.

The Level 0 Consolidated product has the following characteristics:

- produced off line, using highest quality auxiliary data;

- time ordered, with no overlap or data gap (except when the instrument is not operated);

- respecting specific instrument operation sequence boundary for continuous operation instruments, or segments for instruments operated on a regional basis.

The complete list of products to which the information in this volume applies is given in Table 6-1. Descriptions of individual Level 0 products are found in the volumes related to the instruments to which they pertain.

**Table 6-1**  Level 0 Products

| Instrument | Product ID | Description |
|---|---|---|
| AATSR | ATS_NL__0P | AATSR Level 0 |
| ASAR | ASA_WV__0P | ASAR Level 0 Wave Mode |
| | ASA_GM__0P | ASAR Level 0 Global Monitoring Mode |
| | ASA_EC__0P | ASAR Level 0 External Characterization |
| | ASA_MS__0P | ASAR Level 0 Module Stepping Mode |
| | ASA_IM__0P | ASAR Level 0 Image Mode |
| | ASA_WS__0P | ASAR Level 0 Wide Swath |
| | ASA_APH_0P | ASAR Level 0 Alternating Polarization (Xpolar H) |
| | ASA_APV_0P | ASAR Level 0 Alternating Polarization (Xpolar V) |
| | ASA_APC_0P | ASAR Level 0 Alternating Polarization (Copolar) |
| DORIS | DOR_NAV_0P | DORIS Navigator Level 0 |
| | DOR_DOP_0P | DORIS Doppler Level 0 |
| GOMOS | GOM_NL__0P | GOMOS Nominal Mode Level 0 |
| | GOM_MM__0P | GOMOS Monitoring Modes (either Linearity, Uniform, or Spatial Spread data) |
| MERIS | MER_RR__0P | MERIS Level 0 Reduced Resolution |
| | MER_RV__0P | MERIS Level 0 Reduced Field of View |
| | MER_CA__0P | MERIS Level 0 Calibration (all calibration modes) |
| | MER_FR__0P | MERIS Level 0 Full Resolution |

**Table 6-1** Level 0 Products

| Instrument | Product ID | Description |
|---|---|---|
| MIPAS | MIP_RW__0P | MIPAS Raw Data and SPE Self Test Mode Data |
| | MIP_NL__0P | MIPAS Nominal Level 0 |
| | MIP_LS__0P | MIPAS Line of Sight Level 0 |
| MWR | MWR_NL__0P | MWR Level 0 |
| RA2 | RA2_ME__0P | RA2 Measurement Mode Level 0 |
| | RA2_CAL_0P | RA2 Calibration and BITE Mode Level 0 |
| SCIAMACHY | SCI_NL__0P | SCIAMACHY Level 0 |
| Extracted Calibration | Same as Level 0 IDs but with the P changed to a C | Extracted Calibration products are Level 0 child products (i.e. a selected portion of the Level 0 product is extracted to form a child product) |
| House Keeping Telemetry | TLM_HK__0P | Satellite platform monitoring data. |

## 6.1 LEVEL 0 FORMAT

A summary of the general structure of the Level 0 product is shown in Table 6.1-1.

**Table 6.1-1** Level 0 Product Structure

| |
|---|
| **Main Product Header** (see Table 5.2.2-1) |
| **Specific Product Header** (see Table 6.1.1-1)<br><br>Data Set Descriptor for MDS (see Table 5.4.2-1)<br>Data Set Descriptor for Level 0 Processor Configuration file (see Table 5.4.2-1)<br>Data Set Descriptor for Orbit State Vectors file (see Table 5.4.2-1)<br>Data Set Descriptor - Spare (see Section 5.4.3.4) |
| **Measurement Data Set** |
| MDSR #1 (see Table 6.1.2-1) |
| ••••• |
| Last MDSR (see Table 6.1.2-1) |

As shown, each Level 0 product consists of an MPH, an SPH, and an MDS.

## 6.1.1 **Level 0 SPH Format**

A standard SPH format has been defined for all ENVISAT Level 0 data. The format follows the same ASCII format conventions of the MPH. The Level 0 SPH is described in Table 6.1.1-1.

**Table 6.1.1-1** Level 0 SPH

| Field # | Description | units | Byte length | Data Type | Dim. |
|---|---|---|---|---|---|
| 1 | **SPH_DESCRIPTOR=** | keyword | 15 | uc | 15 |
| | quotation mark (") | - | 1 | uc | 1 |
| | **SPH Descriptor**<br>ASCII string describing the product.<br>Format:<br><Product ID>ØSPECIFICØHEADER where the product ID contains 10 characters as defined in Volume 4.<br>If needed, blanks are located to the right of the last character in the text string.<br>e.g. MER_RR__0PØSPECIFICØHEADERØØ | - | 28 | uc | 28 |
| | quotation mark (") | - | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |
| | *Product Location Information* | | | | |
| 2 | **START_LAT=** | keyword | 10 | uc | 10 |
| | WGS84 latitude of first satellite nadir point at the Sensing Start time of the MPH (positive north) | $10^{-6}$ degrees | 11 | Al | 1 |
| | **<10-6degN>** | units | 10 | uc | 10 |
| | newline character | terminator | 1 | uc | 1 |
| 3 | **START_LONG=** | keyword | 11 | uc | 11 |
| | WGS84 longitude of first satellite nadir point at the Sensing Start time of the MPH (positive East, 0 = Greenwich) | $10^{-6}$ degrees | 11 | Al | 1 |
| | **<10-6degE>** | units | 10 | uc | 10 |
| | newline character | terminator | 1 | uc | 1 |

**Table 6.1.1-1** Level 0 SPH

| Field # | Description | units | Byte length | Data Type | Dim. |
|---|---|---|---|---|---|
| 4 | **STOP_LAT=** | keyword | 9 | uc | 9 |
| | WGS84 latitude of first satellite nadir point at the Sensing Stop time of the MPH (positive north) | $10^{-6}$ degrees | 11 | Al | 1 |
| | **<10-6degN>** | units | 10 | uc | 10 |
| | newline character | terminator | 1 | uc | 1 |
| 5 | **STOP_LONG=** | keyword | 10 | uc | 10 |
| | WGS84 longitude of first satellite nadir point at the Sensing Stop time of the MPH (positive East, 0 = Greenwich) | $10^{-6}$ degrees | 11 | Al | 1 |
| | **<10-6degE>** | units | 10 | uc | 10 |
| | newline character | terminator | 1 | uc | 1 |
| 6 | **SAT_TRACK=** | keyword | 10 | uc | 10 |
| | Sub-satellite track heading at the Sensing Start time in the MPH. | degrees | 15 | Afl | 1 |
| | **<deg>** | units | 5 | uc | 5 |
| | newline character | terminator | 1 | uc | 1 |
| 7 | **Spare (blank characters (Ø))** | - | 50 | uc | 50 |
| | newline character | terminator | 1 | uc | 1 |
| | *Product Confidence Data Information* | | | | |
| 8 | **ISP_ERRORS_SIGNIFICANT=** | keyword | 23 | uc | 23 |
| | 1 or 0.<br>1 if number of ISPs with CRC errors exceeds threshold | | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 9 | **MISSING_ISPS_SIGNIFICANT=** | keyword | 25 | uc | 25 |
| | 1 or 0.<br>1 if number of missing ISPs exceeds threshold | | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 10 | **ISP_DISCARDED_SIGNIFICANT=** | keyword | 26 | uc | 26 |
| | 1 or 0.<br>1 if number of ISPs discarded by the PF-HS exceeds threshold | | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |

**Table 6.1.1-1** Level 0 SPH

| Field # | Description | units | Byte length | Data Type | Dim. |
|---|---|---|---|---|---|
| 11 | **RS_SIGNIFICANT=** | keyword | 15 | uc | 15 |
| | 1 or 0.<br>1 if number of ISPs with Reed Solomon corrections exceeds threshold | | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 12 | **Spare (blank characters (Ø))** | - | 50 | uc | 50 |
| | newline character | terminator | 1 | uc | 1 |
| | *Other Product Quality Information* | | | | |
| 13 | **NUM_ERROR_ISPS=** | keyword | 15 | uc | 15 |
| | Number of ISPs containing CRC errors. | ISPs | 11 | Al | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 14 | **ERROR_ISPS_THRESH=** | keyword | 18 | uc | 18 |
| | Threshold at which number of ISPs containing CRC errors is considered significant. | percent | 15 | Afl | 1 |
| | **<%>** | units | 3 | uc | 3 |
| | newline character | terminator | 1 | uc | 1 |
| 15 | **NUM_MISSING_ISPS=** | keyword | 17 | uc | 17 |
| | Number of missing ISPs. | ISPs | 11 | Al | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 16 | **MISSING_ISPS_THRESH=** | keyword | 20 | uc | 20 |
| | Threshold at which number of ISPs missing is considered significant | percent | 15 | Afl | 1 |
| | **<%>** | units | 3 | uc | 3 |
| | newline character | terminator | 1 | uc | 1 |
| 17 | **NUM_DISCARDED_ISPS=** | keyword | 19 | uc | 19 |
| | Number of ISPs discarded by PF-HS. | ISPs | 11 | Al | 1 |
| | newline character | terminator | 1 | uc | 1 |

**Table 6.1.1-1**  Level 0 SPH

| Field # | Description | units | Byte length | Data Type | Dim. |
|---|---|---|---|---|---|
| 18 | **DISCARDED_ISPS_THRESH=** | keyword | 22 | uc | 22 |
| | Threshold at which number of ISPs discarded by PF-HS is considered significant | percent | 15 | Afl | 1 |
| | **<%>** | units | 3 | uc | 3 |
| | newline character | terminator | 1 | uc | 1 |
| 19 | **NUM_RS_ISPS=** | keyword | 12 | uc | 12 |
| | Number of ISPs with Reed Solomon corrections | ISPs | 11 | Al | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 20 | **RS_THRESH=** | keyword | 10 | uc | 10 |
| | Threshold at which number of ISPs with Reed Solomon corrections is considered significant | percent | 15 | Afl | 1 |
| | **<%>** | units | 3 | uc | 3 |
| | newline character | terminator | 1 | uc | 1 |
| 21 | **Spare (blank characters (Ø))** | - | 100 | uc | 100 |
| | newline character | terminator | 1 | uc | 1 |
| | *ASAR Specific Information* | | | | |
| 22 | **TX_RX_POLAR=** | keyword | 12 | uc | 12 |
| | quotation mark (") | - | 1 | uc | 1 |
| | **Polarization** (used for ASAR only) HV/HV, H/HVØ, V/VHØ, H/HØØ, H/VØØ, or V/VØØ, or V/HØØ The letter(s) to the left of the '/' indicates the transmitter polarization. The letter(s) to the right of the '/' indicates the receiver polarization. ØØØØØ for non-ASAR products. | ascii | 5 | uc | 5 |
| | quotation mark (") | - | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |

**Table 6.1.1-1**  Level 0 SPH

| Field # | Description | units | Byte length | Data Type | Dim. |
|---|---|---|---|---|---|
| 23 | **SWATH=** | keyword | 6 | uc | 6 |
| | quotation mark (") | - | 1 | uc | 1 |
| | **Swath Number** (used for ASAR only)<br>codes: IS1, IS2, IS3, IS4, IS5, IS6, IS7, WSØ -- WS is used for WS mode and GM mode. For ASA_EC__OP and ASA_MS__OP, the field is set to EC0 and MC0, respectively. ØØØ for non-ASAR products. | ascii | 3 | uc | 3 |
| | quotation mark (") | - | 1 | uc | 1 |
| | newline character | terminator | 1 | uc | 1 |
| 24 | **Spare (blank characters (Ø))** | - | 41 | uc | 41 |
| | newline character | terminator | 1 | uc | 1 |
| | *Data Set Descriptors* | | | | |
| 25 | **DSD (M) for MDS**<br>Contents as defined in Section 6.1.1.1. | - | 280 | dsd | 1 |
| 26 | **DSD (R) pointing to Configuration file**<br>Contents as defined in Section 6.1.1.1 | - | 280 | dsd | 1 |
| 27 | **DSD (R) pointing to the Orbit State Vector file used** | - | 280 | dsd | 1 |
| 28 | **DSD - Spare (279 blank space characters followed by 1 newline character)** | - | 280 | dsd_sp | 1 |
| **Total** | | - | 1956 | | |

## 6.1.1.1   Level 0 DSD Format

There will be 4 DSDs in the Level 0 SPH. The first DSD describes the MDS (the source packets) the second is a reference DSD which contains the name of the Level 0 Processor Configuration File used to create the product, and the third is a reference DSD which contains the name of the Orbit State Vector file used to create the product. Finally, the fourth is a spare DSD, reserved to allow future additions to the product if needed.

A general DSD structure has been defined as in Table 5.4.2-1. The fields of the DSD are filled as follows:

**DSD for the MDS:**

DS_NAME=

one of:

1. "ASAR_SOURCE_PACKETSØØØØØØØØ"
2. "AATSR_SOURCE_PACKETSØØØØØØØØ"
3. "DORIS_SOURCE_PACKETSØØØØØØØØ"
4. "GOMOS_SOURCE_PACKETSØØØØØØØØ"
5. "MERIS_SOURCE_PACKETSØØØØØØØØ"
6. "MIPAS_SOURCE_PACKETSØØØØØØØØ"
7. "MWR_SOURCE_PACKETSØØØØØØØØØ"
8. "RA2_SOURCE_PACKETSØØØØØØØØØ"
9. "SCIAMACHY_SOURCE_PACKETSØØØØØ"
10. "HOUSEKEEPING_PACKETSØØØØØØØØ"

DS_TYPE =M

FILENAME= "ØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØ
ØØØØØØØØØØØØØØØØØØØØØØØØØØ"

DS_OFFSET= (MPH length + SPH length including DSDs)<bytes>

DS_SIZE= (data dependent)<bytes>

NUM_DSR=(data dependent)

DSR_SIZE=(data dependent, set to -1 if size is variable)<bytes>

**DSD Referencing the Level 0 Config. file, or the Orbit State Vector file:**

DS_NAME="LEVEL_0_CONFIGURATION_FILEØØ" or
"ORBIT_STATE_VECTOR_FILEØØØØØ"

DS_TYPE=R

FILENAME="(filename)"[1]

DS_OFFSET=+00000000000000000000<bytes>

DS_SIZE=+00000000000000000000<bytes>

NUM_DSR=+0000000000

1. Refer to Volume 16 for Auxiliary Data file naming details. Note the filename is left justified within the quotation marks, with any blank spaces added before the closing quote.

DSR_SIZE=+0000000000<bytes>

**DSD - Spare**

This DSD is simply 279 ASCII blank space characters followed by 1 ASCII newline character

## 6.1.2    Level 0 MDS Format

The exact contents of the Level 0 MDSRs is instrument and mode specific, however it will follow a common structure as shown in Table 6.1.2-1. The Level 0 Measurement Data Set (MDS) will consist of a series of annotated Instrument Source Packets (AISPs). The annotation consists of the header added to the ISP by the Front End Processor (FEP) plus the sensing time added by the Level 0 processor (as converted from the Satellite Binary Time counter embedded in each ISP). This stamp allows for later extraction of specific regions of the MDS.

**Table 6.1.2-1**  Level 0 MDSR Structure

| Annotations | | Instrument Source Packet | | | | |
|---|---|---|---|---|---|---|
| **Level 0 Processor Annotations** | **FEP Annotations** | **Packet Header** | | | **Packet Data Field** | |
| ISP Sensing Time (MJD) | FEP Quality Data and reception time stamp[a] | Packet Identification | Packet Sequence Control | Packet Length | Data Field Header | Source Data |
| 12 bytes | 20 bytes | 2 bytes | 2 bytes | 2 bytes | INSTRUMENT SPECIFIC[b] | |

a. Ground Segment Reference Time
b. Note that the Data Field Header for all ENVISAT instruments has been standardized such that the first 3 fields are: Data Field Header Length (16 bits), Instrument Mode Definition (16 bits), ICU OBT code (32 bits except for ASAR, RA-2, and GOMOS which are 48 bit codes).

Further description of specific Level 0 products is found in the volumes pertaining to the instrument with which the product is associated. Detailed description of the contents of Instrument Source Packets for all instruments can be found in Document A-1.

### 6.1.2.1   FEP Annotations

The FEP annotations describe the quality of the ISP reconstruction process. The FEP Header will follow the structure of Table 6.1.2.1-1:

**Table 6.1.2.1-1**   FEP Header

| Field # | Description | Units | Byte length | Data Type |
|---|---|---|---|---|
| 1 | **MJD 2000 Time Stamp**<br>Ground Station Reference Time of reception. Refer to ANNEX A for format information. | MJD 2000 | 12 | s1 2*ul |
| 2 | **Length of ISP = (length of source packet excluding 6 byte header)-1[a]** | bytes | 2 | us |
| 3 | **Number of VCDUs in the ISP which contain a CRC error**<br>As identified by a failed Cyclic Redundancy Code check. | VCDU | 2 | us |
| 4 | **Number of VCDUs in the ISP for which a Reed-Solomon error correction was performed** | VCDU | 2 | us |
| 5 | **Spare (set to zero)** | - | 2 | 2*uc |
| **TOTAL** | | | 20 | |

a. This field uses the same definition as the Packet Length field of the Packet Header.

## 6.2     LEVEL 0 AUXILIARY DATA FILES

The general format of auxiliary data used to create products will follow the structure described in Volume 16. For Level 0, the only auxiliary data required is the orbit state vectors, the SBT to UTC time conversion parameters, and the Level 0 processor configuration file.

### 6.2.1     Level 0 Processor Configuration File

The Level 0 processor configuration file is an auxiliary data file used by the Level 0 processor. It contains software configuration information needed by the Level 0 processor. This includes the threshold values used to determine if PCD error messages are produced.

FILE_ID: AUX_CN0_AX

USE: Used during level 0 processing

UPDATED: infrequently

SIZE: MPH (1247 bytes) + SPH (378 bytes) + GADS (176 bytes)

### 6.2.1.1 Format

The MPH and SPH of these files will follow the standard MPH, SPH structure of all ENVISAT auxiliary data as described in Volume 16. The file will consist of a single GADS as shown below:

**Table 6.2.1.1-1** Format of GADS for Level 0 Processor Configuration File

| Description | units | Byte length | Data Type |
|---|---|---|---|
| **Time of creation** | MJD 2000 | 12 | s1 2*ul |
| **Threshold for percentage of ISPs with CRC errors that causes PCD flag to be set.** | % | 4 | fl |
| **Threshold for percentage of missing ISPs that causes PCD flag to be set.** | % | 4 | fl |
| **Threshold for percentage of ISPs discarded that causes PCD flag to be set.** | % | 4 | fl |
| **Threshold for percentage of ISP with RS corrections which causes PCD flag to be set.** | % | 4 | fl |
| **Spare (set to zero)** | - | 20 | 20*uc |
| **Processor Configuration Information (set to zero)** | - | 128 | 128*uc |
| **TOTAL** | | 176 | |

### 6.2.2 Orbit State Vectors Files

The Orbit State Vectors files as received from the FOS are described in Volume 16, Section 16.3.1. Orbit State Vectors files as received from DORIS are described in Volume 9.

### 6.2.3 UTC/SBT Time Conversion File

The UTC/SBT Time Conversion file is described in Volume 16.

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