4.2 Storage file format

①Function

This section shows a file format specification for which the LS-7000XT stores to a CF card.

②File

For files for which an LS-7000XT stores (refers to) to a CF card, a setting file, setting analysis result file, time calibration information file, trigger information file and data file exist.

Data of a short period 1 minute file (WIN file) is generated.

Table File type

File type	File name	Storage directory
Setting XML	LS7000.XML	¥
Setting analysis result	XMLTOSYS.TXT	¥
Time calibration information	TCAL.TXT	¥
Trigger information	TRIGGER.TXT	¥
Short period data	Year, month, day, o'clock, minutes	DATA¥SHORT¥ Year, month, day¥ Year, month, day, o'clock

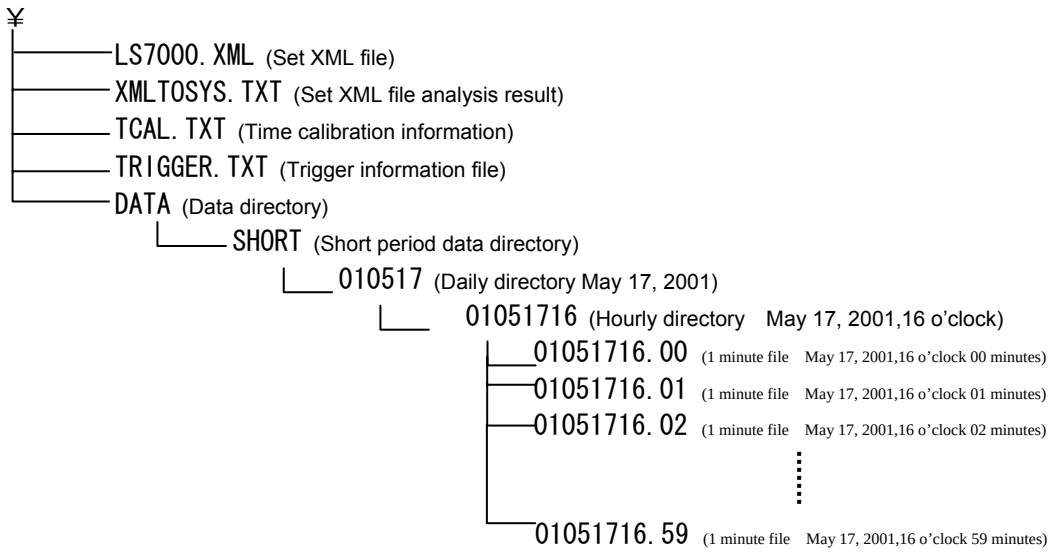


Figure Directory structure of a CF card

③File format

The set file is of well-formed XML document and has the following content.

```
<?xml version="1.0" >
- <ls7000 version="0.91">
    <title>DATAMARK</title>
  - <measure>
    - <channel>
        <ch>1</ch>                                  Specify first ch.
        <win>0000</win>                             Win channel No. of measurement block 1
        <gain unit="dB">0</gain>                    ch1 gain, select from  0, 20, OFF.
        <frequency unit="Hz">100</frequency>        Measurement interval of measurement block 1
                                                    Select from 200, 100, 50,1.
        <bits>24</bits>                             Effective bit number of measurement block 1
                                          Select from 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14.
      </channel>
    - <channel>
        <ch>2</ch>                                  Specify second ch.
        <win>0001</win>                             Setting of ch2 is ineffective, setting of ch1 + 1 is
                                                    effective.
        <gain unit="dB">0</gain>                    ch2 gain, select from 0, 20, OFF.
        <frequency unit="Hz">100</frequency>        Setting of ch2 is ineffective, setting of ch1 is
                                                    effective.
        <bits>24</bits>                             Setting of ch2 is ineffective, setting of ch1 is
                                                    effective.
      </channel>
    - <channel>
        <ch>3</ch>                                  Specify third ch.
        <win>0002</win>                             Setting of ch3 is ineffective, setting of ch1 + 2 is
                                                    effective.
        <gain unit="dB">0</gain>                    ch3 gain, select from 0, 20, OFF.
        <frequency unit="Hz">100</frequency>        Setting of ch3 is ineffective, setting of ch1 is
                                                    effective.
        <bits>24</bits>                             Setting of ch3 is ineffective, setting of ch1 is
                                                    effective.
      </channel>
    - <channel>
        <ch>4</ch>                                  Specify fourth ch.
        <win>0003</win>                             Win channel No. of measurement block 2
        <gain unit="dB">0</gain>                    ch4 gain, select from  0, 20, OFF.
        <frequency unit="Hz">100</frequency>        Measurement interval of measurement block 2
                                                    Select from 200, 100, 50,1.
        <bits>24</bits>                             Effective bit number of measurement block 2
                                          Select from 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14.
      </channel>
    - <channel>
        <ch>5</ch>                                  Specify fifth ch.
        <win>0004</win>                             Setting of ch5 is ineffective, setting of ch4 + 1 is
                                                    effective.
        <gain unit="dB">0</gain>                    ch5 gain, select from 0, 20, OFF.
        <frequency unit="Hz">100</frequency>        Setting of ch5 is ineffective, setting of ch4 is
                                                    effective.
        <bits>24</bits>                             Setting of ch5 is ineffective, setting of ch4 is
                                                    effective.
      </channel>
    - <channel>
        <ch>6</ch>                                  Specify sixth ch.
        <win>0005</win>                             Setting of ch6 is ineffective, setting of ch4 + 2 is
                                                    effective.
        <gain unit="dB">0</gain>                    ch6 gain, select from 0, 20, OFF.
        <frequency unit="Hz">100</frequency>        Setting of ch6 is ineffective, setting of ch4 is
                                                    effective.
        <bits>24</bits>                             Setting of ch6 is ineffective, setting of ch4 is
                                                    effective.
      </channel>
      <filter>LINEAR</filter>                       Filter setting, select from LINEAR, MINIMUM.
      <cut_off unit="%">40</cut_off>
    </measure>
```

```
- <trigger>
  - <sta_lta_trigger>                                  STA/LTA trigger, for details, refer to 2.5.7.
      <channel>1</channel>                             Trigger channel No., select from 1 to 6.
      <lopass>40</lopass>
      <hipass>160</hipass>
      <sta>1280</sta>                                  STA calculation time (sample number)
      <lta>10240</lta>                                 LTA calculation time (sample number)
      <s_l_begin>3</s_l_begin>                         Trigger start condition (STA/LTA value)
      <s_l_end>2</s_l_end>                             Trigger end condition (STA/LTA value)
      <s_l_count>3</s_l_count>                         Trigger start condition (continuous trigger number)
    </sta_lta_trigger>

  - <level_trigger>                                    Trigger level, for details, refer to 2.5.8.
      <channel>1</channel>                             Trigger channel No., select from 1 to 6.
      <level unit="count">50</level>                   Trigger level, specify by digit value.
    </level_trigger>
  </trigger>
- <record>
    <trigger>STA/LTA</trigger>                         Trigger selection
                                                       Select from STA/LTA, LEVEL, NONE, ALL.
    <pre_trigger unit="sec">20</pre_trigger>           Pre-trigger time
    <post_trigger unit="sec">60</post_trigger>         Post-trigger time
    <overwrite>NO</overwrite>                          Old data is overwritten when CF is full.
  </record>
- <communication>
  - <com1>
      <baud unit="bps">38400</baud>                    SERIAL 1 communications speed
                                                       Select from 4800, 9600, 19200, 38400.
      <bits>8</bits>                                   Data bit length 8 bit fixed
      <parity>none</parity>                            Parity NONE parity fixed
      <stopbits>1</stopbits>                           Stop bit 1 bit fixed
      <flowctrl>NONE</flowctrl>                        Flow control, select from NONE, RTS/CTS.
    </com1>
  - <com2>
      <baud unit="bps">38400</baud>                    SERIAL 2 communications speed
                                                       Select from 4800, 9600, 19200, 38400.
      <bits>8</bits>                                   Data bit length 8 bit fixed
      <parity>none</parity>                            Parity NONE parity fixed
      <stopbits>1</stopbits>                           Stop bit 1 bit fixed
      <flowctrl>NONE</flowctrl>                        Flow control, select from NONE, RTS/CTS.
    </com2>
  - <tcpip>
      <IPaddress>192.168.000.001</IPaddress>           IP address
      <netmask>255.255.255.000</netmask>               Net mask
      <default_gateway>192.168.000.254</default_gateway> Default gateway
      <device>NONE</device>                            TCP/IP address
                                                       Select from EtherNet, PPP, NONE.
    </tcpip>
  - <win_udp>
      <IPaddress>192.168.000.002</IPaddress>           Opposite station IP address
      <win_port> 7000</win_port>                       Opposite station data transmission port No.
      <mywin_port> 3000</mywin_port>                   Self station data re-transmission demand port No.
      <status_port> 8000</status_port>                 Opposite station status transmission port No.
      <mystatus_port> 4000</mystatus_port>             Self station status re-transmission demand port No.
    </win_udp>
  - <realtime_output>
      <device>NONE</device>                            Real time output device
                                                       Select from NONE, WIN_UDP, COM2.
      <win_format>A1</win_format>                      Win data format, select from A0, A1.
      <setting_output>MINUTE</setting_output>          Setting information XML transmission interval
                                                       Select from NONE, START, MINUTE, HOUR,
                                                       DAY.
      <motion_output>MINUTE</motion_output>            Motion information XML transmission interval
                                                       Select from NONE, START, MINUTE, HOUR,
                                                       DAY.
    </realtime_output>
  </communication>
- <time_cal>
  - <location>
```

```
        <timezone>-09:00</timezone>          Local zone time
        <latitude>N3540.4362</latitude>      Latitude
        <longitude>E13928.3881</longitude>   Longitude
        <altitude>000108.0</altitude>        Altitude
      </location>
      <mode>AUTO</mode>                      Time calibration mode, select from NONE,
          AUTO, FIX.
      <interval>1:00</interval>              Time calibration interval
                                           Select from 0:00, 1:00, 2:00, 3:00, 4:00, 6:00, 8:00,
                          12:00, 24:00.
      <adjust>ON</adjust>                    Adjust TCXO according to time calibration result.
                                             ON: Adjust.  OFF: Does not adjust.
    </time_cal>
</ls7000>
```

④Time calibration information

Time calibration information file is a text file. Each line is appended for each time calibration.

Note: When data is not saved, time calibration information is not saved.

The following shows a format of a one time calibration information.

Position (byte)	Item	Size (byte)	Model	Content
0	Time calibration completion time	18	Char[18]	(Example) “01/05/24 15:38:52” May 24, 2001, 15 hours 38minutes 52 seconds
18	Error (msec)	8	Char[8]	(Example) “002msec” 2msec
26	Error (count)	9	Char[9]	The unit is 76.294nsec unit. Represented in hexadecimal number 8 digits (Example) “FFFFFF5C” =-164 =-12.512μsec
35	TCXO adjustment (for maker maintenance)	10	Char[10]	For maker maintenance (Example) “TCX0= 2”
45	Temperature (for maker maintenance)	11	Char[11]	For maker maintenance (Example) “TEMP=36.5”
56	Time calibration result	6	Char[6]	“TRUE” : Success “FALSE” : Failure
62	Return and start new line	2	Char[2]	0DH、0AH

* The position means position from the head of line.

TCAL.TXT Example

02/03/24 18:00:09 000msec 00000430 TCXO= 2 TEMP= 36.0 TRUE
02/03/24 19:00:41 000msec FFFFFF5C TCXO= 2 TEMP= 36.5 TRUE
02/03/24 20:00:10 000msec FFFFFA87 TCXO= 2 TEMP= 37.5 TRUE

⑤TRIGGER file

Trigger file is a file in which trigger information of STA/LTA trigger is recorded. Each line is appended for each event (Start, Stop, Restart).

The following shows a format of trigger information for one time STA/LTA trigger.

Position* (byte)	Item	Size (byte)	Model	Content
0	Status	7	Char[7]	"Start" Start trigger when earthquake occurs "Stop" Stop trigger when earthquake converges "Restart" Re-trigger when post-trigger data is measured when earthquake occurs after earthquake converges
8	Trigger time	21	Char[21]	(Example) "01/01/01 19:17'03.270" January 1, 2001, 19 hours, 17 minutes, 03.270 seconds
30	Measurement data	8	Char[8]	Represented in hexadecimal number 8 digits (Example) "0000003C" = 60
39	STA total value	8	Char[8]	Represented in hexadecimal number 8 digits (Example) "00000659" = 1625
48	STA number	8	Char[8]	Represented in hexadecimal number 8 digits (Example) "00000020" = 32
57	LTA total number	8	Char[8]	Represented in hexadecimal number 8 digits (Example) "00000B36" = 2870
66	LTA number	8	Char[8]	Represented in hexadecimal number 8 digits (Example) "00000100" = 256
75	Offset	8	Char[8]	This is always 0. Represented in hexadecimal number 8 digits (Example) "00000000"

※The position means position from the head of line.

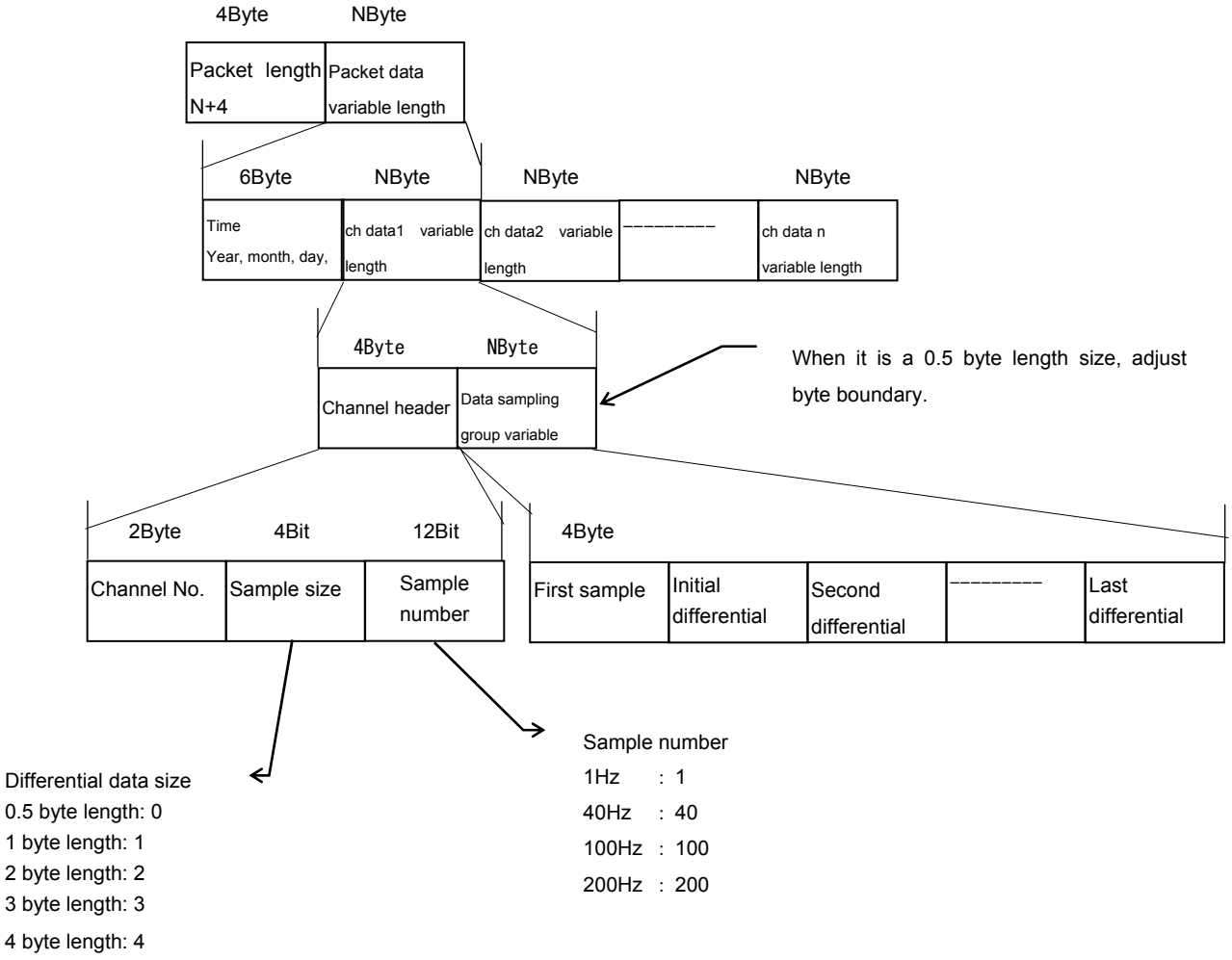
The following shows an example of TRIGGER. TXT.

```
Start    01/01/01 19:17'03.270 0000003C 00000659 00000020 00000B36 00000100 00000000
Stop     01/01/01 19:17'23.990 00000002 000002B2 00000020 00000B36 00000100 00000000
Restart  01/01/01 19:18'03.270 00000617 00000FC4 00000020 00000B36 00000100 00000000
Stop     01/01/01 19:18'08.760 00000009 000002B3 00000020 00000B36 00000100 00000000
Start    01/01/01 19:20'03.480 0000094F 00001DBB 00000020 00002530 00000100 00000000
Stop     01/01/01 19:20'23.080 00000016 00000921 00000020 00002530 00000100 00000000
```

⑥Short period data file

The format of a short period data file is WIN format, which can couple data in the unit of a second block. This device stores all the measurement data within the same minute, and whose sampling frequencies are 1, 40, 100, and 200Hz, in the same 1 minute file.

The following shows a format of a second block.



4.3 Asynchronous WIN protocol specifications

4.3.1 Overview

This section describes specifications of asynchronous WIN protocol of the LS-7000XT, which can be used as an observation device for a real time telemeter using RS-232C by selecting Device=COM2 of [RT-OUTPUT] section.

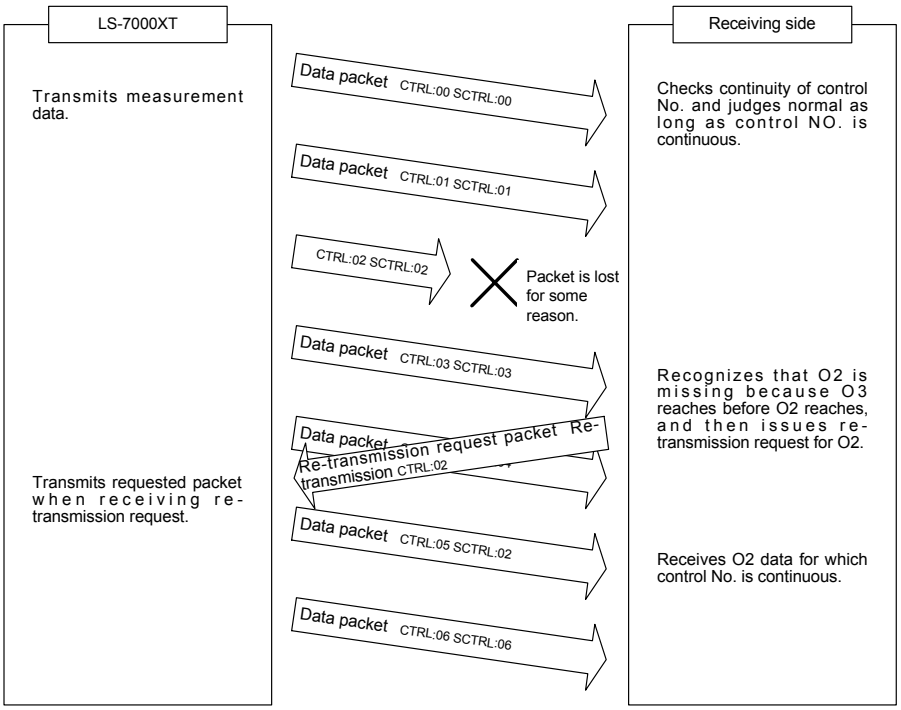
Format of the communications data depends on which PktType=A1 or PktType=A0 of the [RT-OUTPUT] section is selected.

Extended WIN format (*) used mainly for communications on the measurement side is transmitted by selecting packet type A1.

* Extended WIN format is a format highly compatible with LT8500 and LS-7000. For the format, refer to the "4.3.2 Packet type A1 selection."

WIN format used mainly for communications on the analysis side is transmitted by selecting the packet type A0.

Both of the data formats use protocol to transmit re-transmission request for the packet when continuity of control No. is checked and missing is detected.



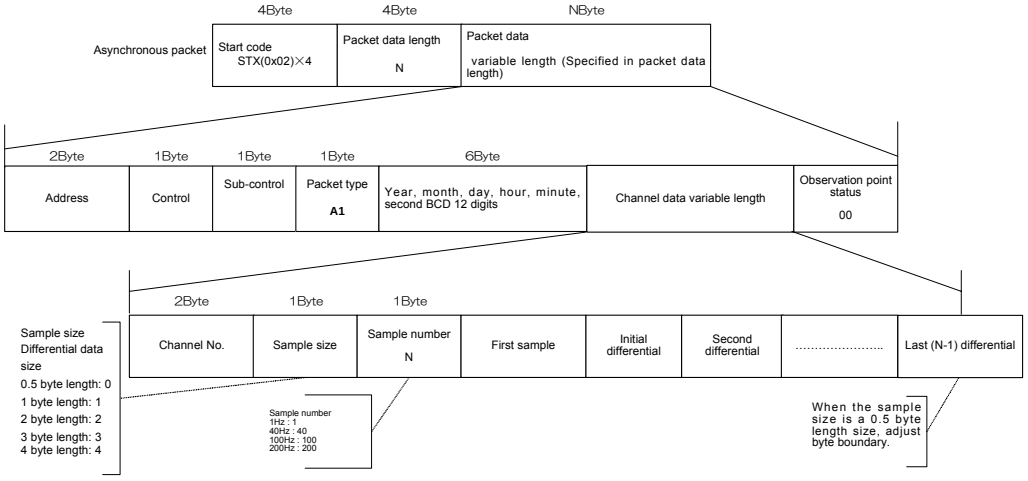
All communication data have a basic structure of asynchronous packet as follows.

4Byte	4Byte	NByte
Start code	Packet data length	Packet data
STX(0x02)×4	N	variable length (Specified in packet data length)

Figure Asynchronous packet basic structure

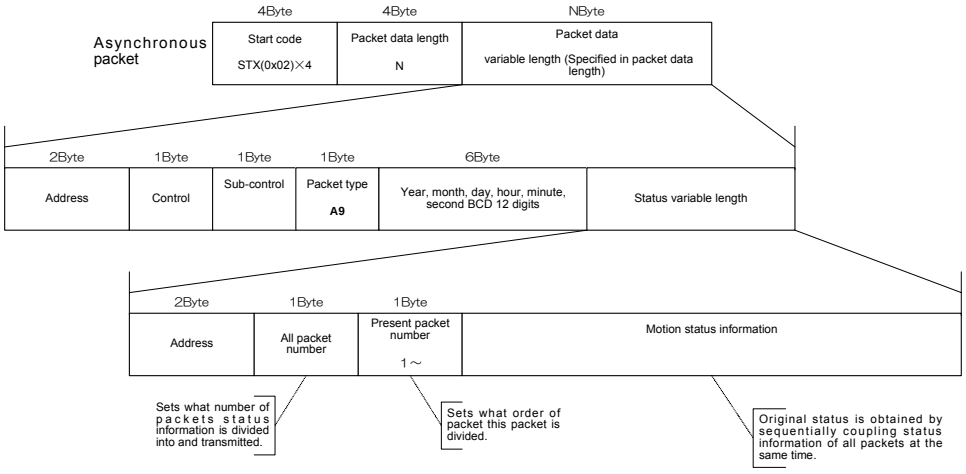
4.3.2 Packet type A1 selection

When PktType=A1 of [RT-OUTPUT] is selected, data (packet type: A1) and status (packet type: A8, A9) are transmitted.
And, when re-transmission request (packet type: DE) is received, the requested packet is transmitted.



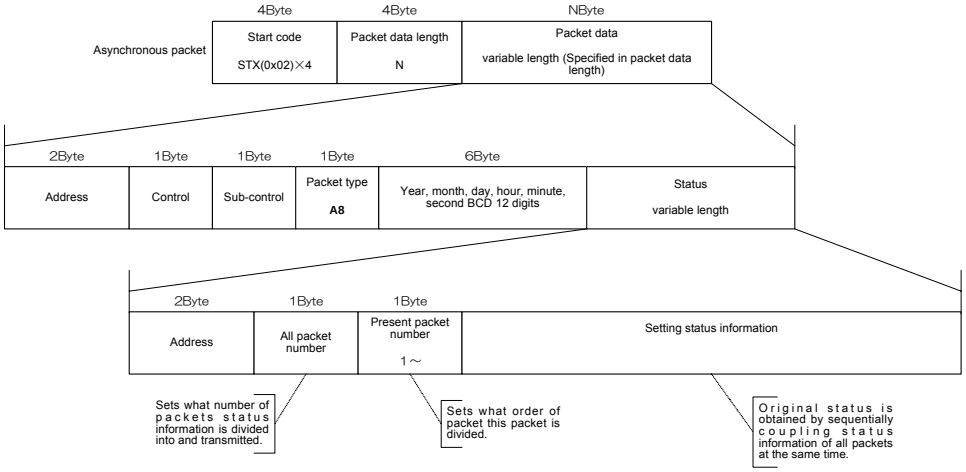
Note: Observation status is always 0.

Figure Data packet structure



Data obtained by coupling motion status information is of XML format.

Figure Data packet structure



Data obtained by coupling setting status information is of XML format, is the same content as that of the setting XML file.

Figure　Setting status packet structure

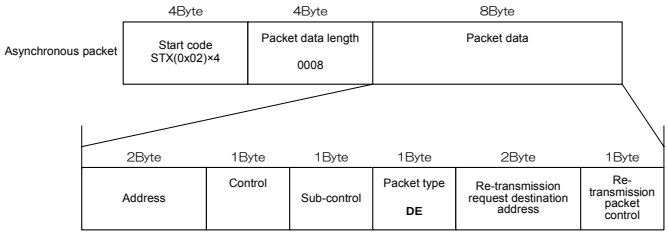


Figure Re-transmission request packet structure

4.3.3 Packet type A0 selection

When PktType=A0 of [RT-OUTPUT] section is selected, data (packet type: A0) and status (packet type: A8, A9) are transmitted.
And, when re-transmission request packet is received, the requested packet is transmitted.

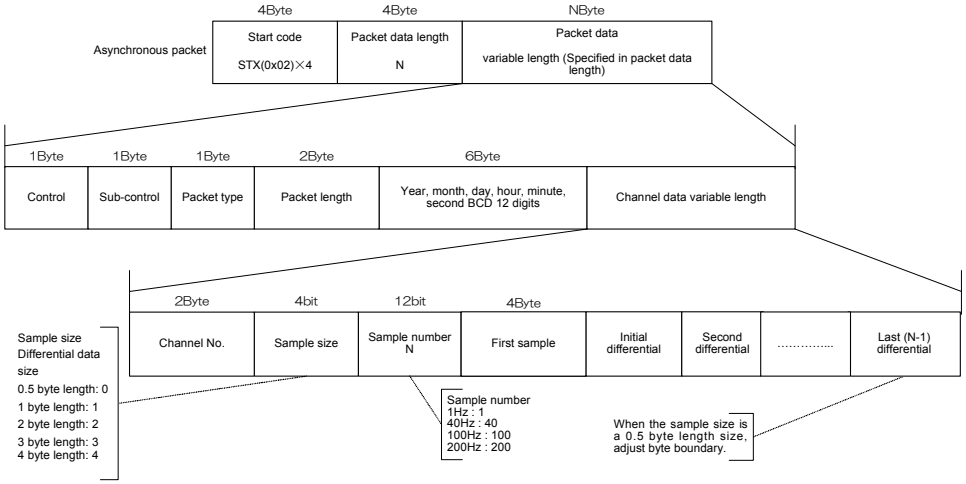
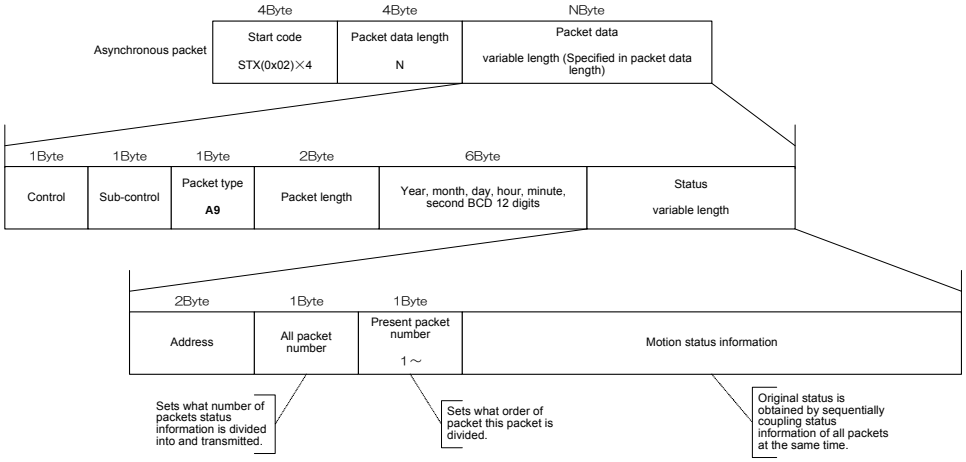
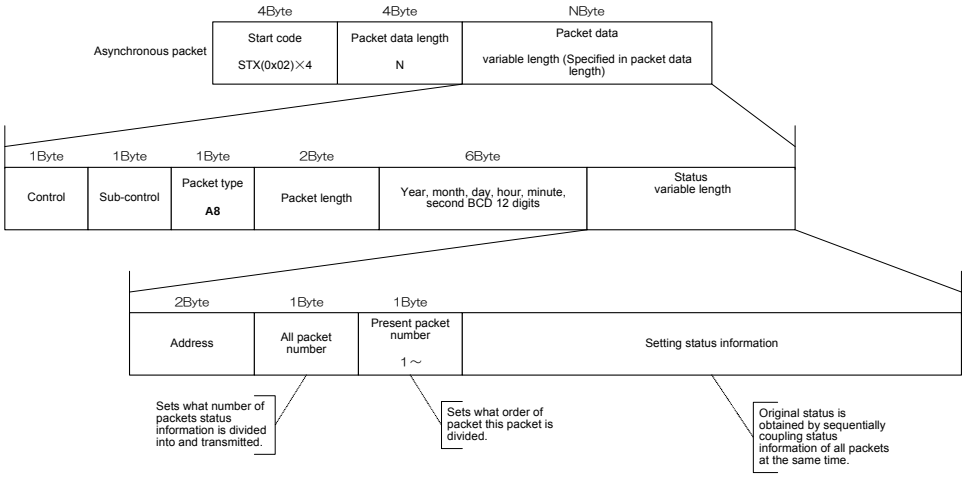


Figure Data packet structure



Data obtained by coupling motion status information is of XML format.

Figure Motion status packet structure



Data obtained by coupling setting status information is of XML format, is the same content as that of the setting XML file.

Figure　Setting status packet structure

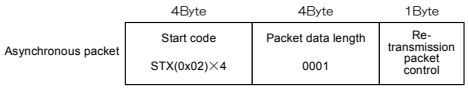


Figure Re-transmission request packet structure

4.4 WIN_UDP protocol specifications

4.4.1 Overview

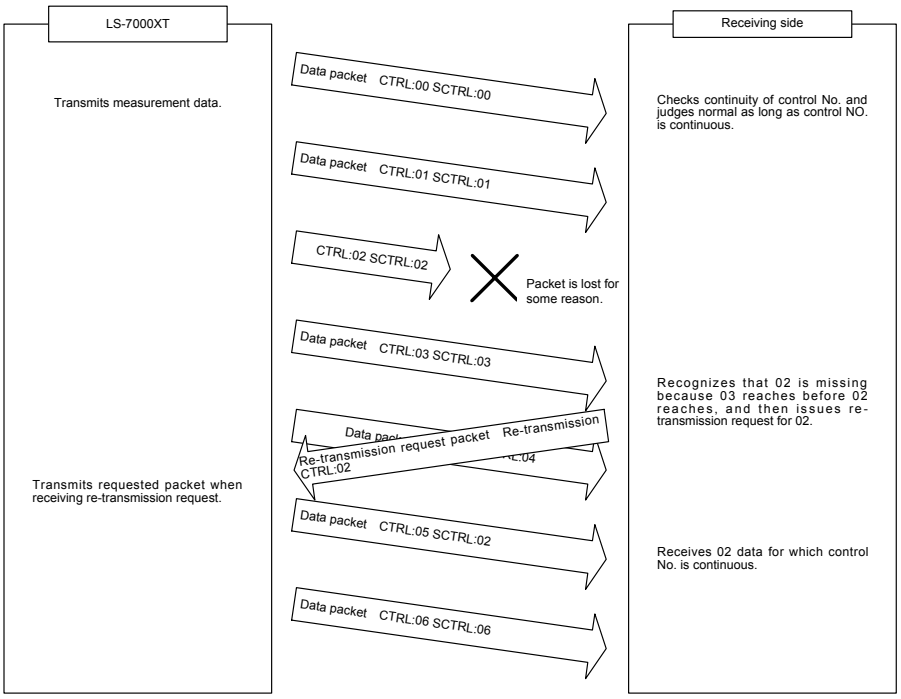
This section describes specifications of WIN_UDP protocol of the LS-7000XT, which can be used as an observation device for a real time telemeter using Ethernet by selecting Device=WIN_UDP of [RT-OUTPUT] section.
Format of the communications data depends on which PktType=A1 or PktType=A0 of the [RT-OUTPUT] section is selected.

Extended WIN format (*) used mainly for communications on the measurement side is transmitted by selecting packet type A1.

* Extended WIN format is a format highly compatible with LT8500 and LS-7000. For the format, refer to the "4.4.2 Packet type A1 selection."

WIN format used mainly for communications on the analysis side is transmitted by selecting the packet type A0.

Both of the data formats use protocol to transmit re-transmission request for the packet when continuity of control No. is checked and missing is detected.



Since WIN_UDP protocol uses separate ports for data and status to communicate, the checking and re-transmission request in recontinuity of control No. is individually checked for data and status.

4.4.2 Packet type A1 selection

When PktType=A1 of [RT-OUTPUT] section is selected, data (packet type: A1) and status (packet type: A8, A9) are transmitted.
And, when re-transmission request (packet type: DE) is received, the requested packet is transmitted.

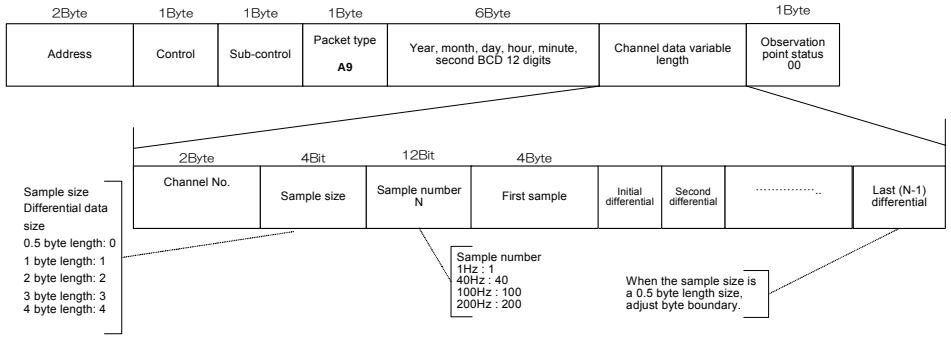
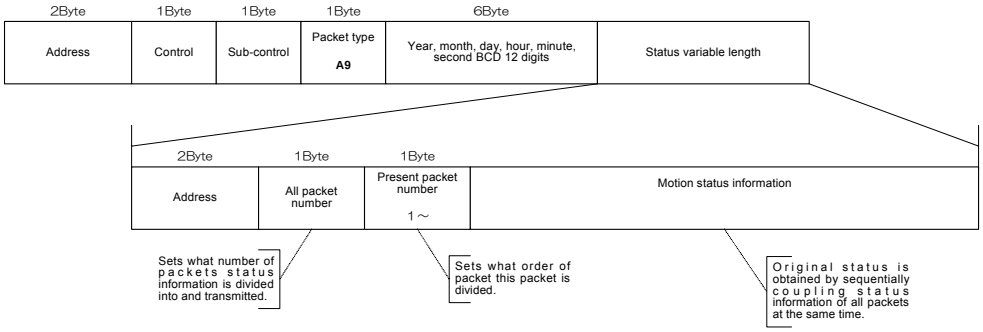
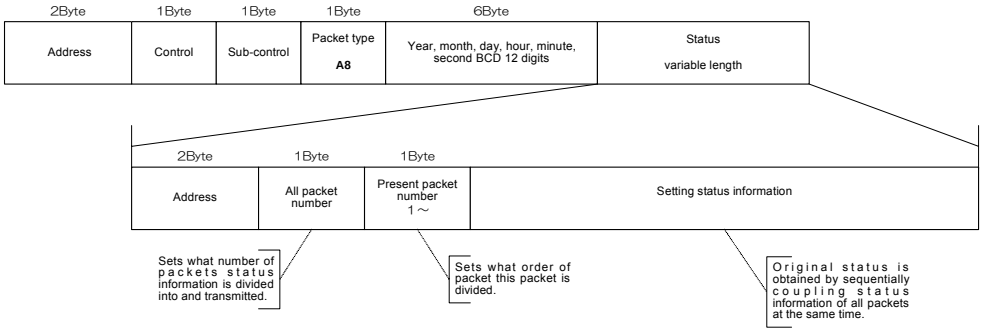


Figure Data packet structure



Data obtained by coupling motion status information is of XML format.

Figure Motion status packet structure



Data obtained by coupling setting status information is of XML format, is the same content as that of the setting XML file.

Figure Setting status packet structure

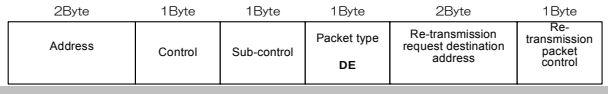


Figure Re-transmission request packet structure

4.4.3 Packet type A0 selection

When PktType=A0 of [RT-OUTPUT] section is selected, data (packet type: A0) and status (packet type: A8, A9) are transmitted.
And, when re-transmission request is received, the requested packet is transmitted.

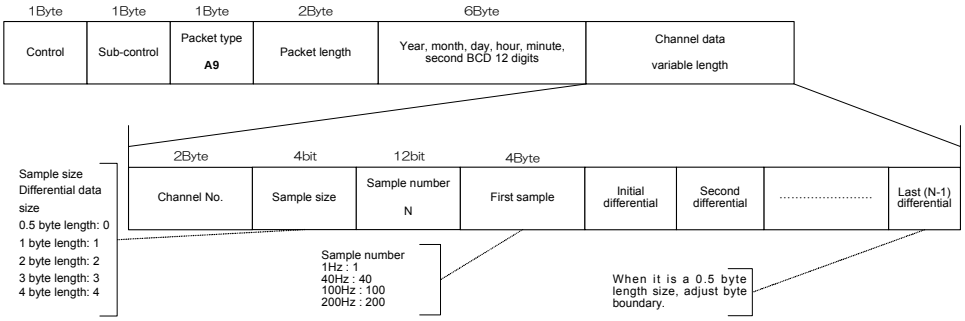
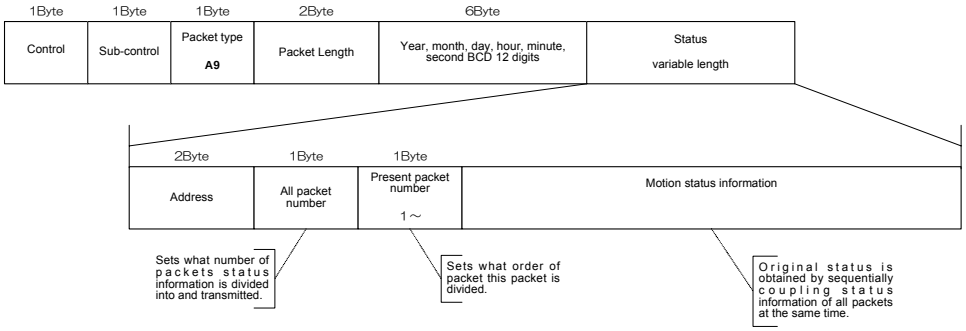
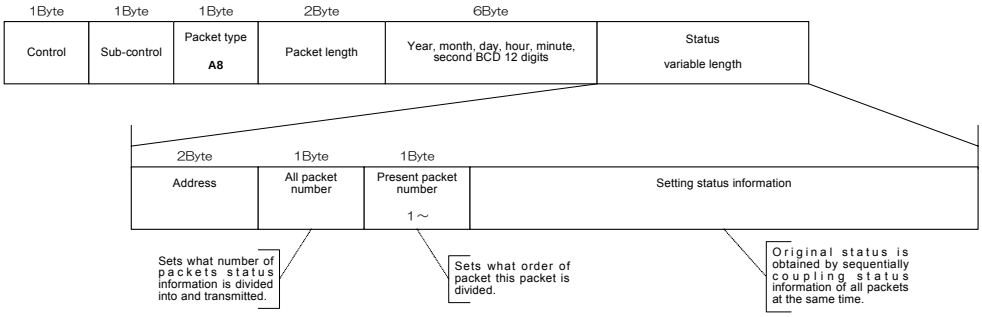


Figure Data packet structure



Data obtained by coupling motion status information is of XML format.

Figure Motion status packet structure



Data obtained by coupling setting status information is of XML format, is the same content as that of the setting XML file.

Figure Setting status packet structure

Figure Re-transmission request packet structure