

TECHNICAL DOCUMENT

REAL TIME DATA

FUTURE & OPTIONS MARKET
(LEVEL 2)

24 APR 2009



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CONTENTS

Chapter	Contents	Page No.
1.	INTRODUCTION	4
2.	CONNECTION DETAILS	
2.1.	STRUCTURAL DIAGRAM	5
2.2.	ONLINE REQUIREMENTS	5
2.3.	STEPS FOR AUTHENTICATION AND RECEIVING FEED	6
2.4.	STEPS FOR DECOMPRESSING FEED	9
3.	DATA DETAILS	
3.1	HEADER	11
3.1.1	CODE	11
3.1.2	LENGTH	11
3.1.3	SEQUENCE NUMBER	11
3.2	THE DATA	11
3.3	TRAILER	11
4.	DATA STRUCTURE DETAILS	
4.1.	LOGIN REQUEST	12
4.1.1.	INFO HEADER	12
4.1.2.	ASCII DATA	12
4.1.3.	INFO TRAILER	12
4.2.	LOGON RESPONSE	12
4.2.1.	COM HEADER	12
4.2.2.	INFO HEADER	12
4.2.3.	ASCII DATA	12
4.2.4.	INFO TRAILER	12
4.3.	MARKET OPEN	12
4.4.	MARKET CLOSE	13
4.5.	MARKET UPDATE INFORMATION	13
4.6.	MARKET MESSAGES INFORMATION	14
4.7.	OPEN INTEREST INFORMATION	15
4.8.	EOD CONTRACT UPDATE INFORMATION	15
4.9.	EOD MARKET INFORMATION	16
4.10.	EOD DATA END INFORMATION	17
4.11.	HEARTBEAT INFORMATION	17
4.12.	SPREAD ORDER UPDATE INFORMATION	18
4.13.	CONTRACT INFORMATION	19
5.	CONTACT INFO	20
6.	NOTE	21
7.	CHECKSUM ALGORITHM	22
8.	EXAMPLE: FUNCTION FOR DECOMPRESSION	23

REAL TIME DATA TECHNICAL SPECIFICATION

FUTURE & OPTIONS MARKET

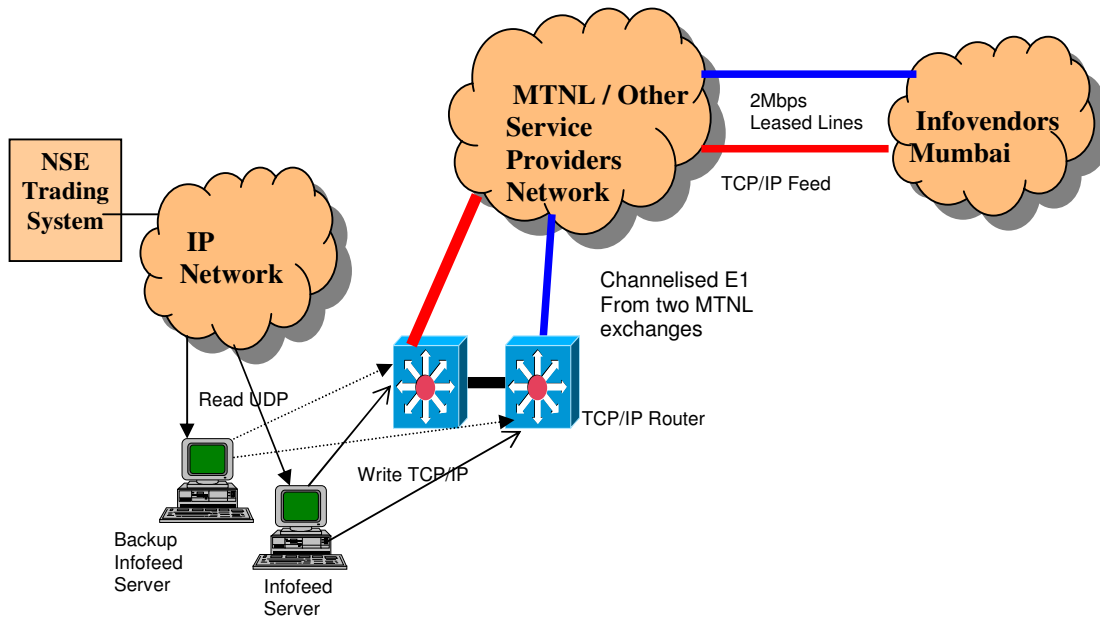
1. INTRODUCTION

DotEx international Ltd. disseminates NSEIL's real time broadcast data to various information agencies. It provides the 3 different types of data to vendors, i.e. Real Time Data, Snapshot Data and End of Day Data. The real time data is a packet broadcast available in TCP/IP format, where as the snapshot data and End of day data is available in the form of files. The Infofeed server provides NSEIL real time broadcast data. The information agencies connect to the Infofeed Server through 2 Mbps Leased Lines. These leased lines are terminated on Infofeed Router and their data specific pneumatic calls are forwarded to Infofeed server. The Infofeed server accepts these pneumatic calls and creates a socket connection. The TCP/IP data flows to the information agencies through these socket connections.

2. CONNECTION DETAILS

2.1. STRUCTURAL DIAGRAM

The structural diagram of Infofeed connection has been explained below -



2.2. Online Requirements

- A Router / Switch or a card with X25 capabilities to connect to 2Mbps transmission lines for receiving NSEIL's Real time information.
- The Information agency should develop applications that initiate TCP/IP calls through 2Mbps Leased Line.

2.3. Steps for Authentication AND Receiving feed

- a) Client applications at vendor end, establish the connection with Infofeed Server application using specified IP address and Port.
- b) After establishing the connection, client application sends the login packet to Infofeed server application.

Packet format of Login packet (LOGIN_REQ) is as follows,

```
struct LOGIN_REQ
{
    struct INFO_HEADER sHeader;
    struct LOGIN_REQ_DATA sData;
    struct INFO_TRAILER sTrailer;
};
struct LOGIN_REQ_DATA {
    char cUserId[10];
    char cPassword[8];
    char cNewPassword[8];
    char cConfmPassword[8];
};
struct INFO_HEADER
{
    short iCode;
    short iLen;
    LONG lSeqNo;
};
struct INFO_TRAILER
{
    short iChecksum;
    CHAR cEOT;
};
```

- c) Password field is case sensitive, password should be minimum 6 characters long, password and user id should not be same, password should start with alphabet and password should be alphanumeric (No wild characters are allowed).
- d) If user wants to change his password then the user needs to specify new password & confirm password (Both fields should match) otherwise leave it blank.
- e) Based on the above information, user will get Log on response (LOGIN_RESPONSE) from Infofeed Server.

```
struct LOGIN_RESPONSE
{
    struct COM_HEADER sCOMHeader;
    struct LOGIN_RESPONSE_DETAIL sDetail;
```

```

};
struct LOGIN_RESPONSE_DETAIL
{
    struct INFO_HEADER sHeader;
    struct LOGIN_RESPONSE_DATA sData;
    struct INFO_TRAILER sTrailer;
};
struct COM_HEADER
{
    char cMopOrNot;
    short iPackLen;
    short iNoOfPack;
};
struct INFO_HEADER
{
    short iCode;
    short iLen;
    LONG lSeqNo;
};
struct INFO_TRAILER
{
    short iCheckSum;
    CHAR cEOT;
};
struct LOGIN_RESPONSE_DATA
{
    long iErrCode;
    char cMesg[50];
};
};

```

Following Error code will be returned which client needs to interpret as:-

1000- Successful

1001- Password Update Successfully

1002- Wrong UserId-Password Combination

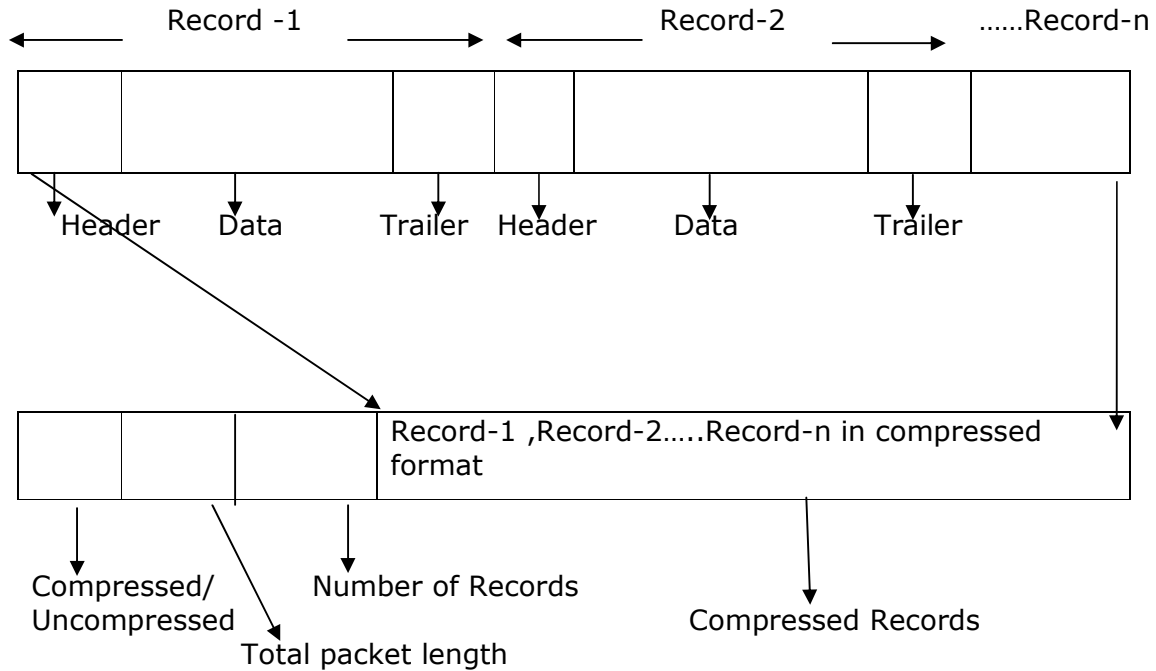
1003- Password is not valid in password change request.

1004- Login request is not correct.

Error code other than above - Error in receiving logon response

- f) After successful login, Infofeed Application starts sending packets in the below format.

Packet Format:



Compressed/Uncompressed: This field tells whether packet is compressed or not compressed.
If this Field = 0 then Compressed.
Field = 1 then Uncompressed.

Number of Records: This field tells the number of records present in the compressed packets.

Packet length: this field specifies the total packet length.

```
Structure COM_HEADER
{
    char cMopOrNot;
    short iPackLen;
    short iNoOfPack;
};
```

- g) As the data packets are sent in compressed format there is a need to decompress them. The compression algorithm used is LZ0.
- h) The Decompression algorithm used should be LZ0

2.4. Steps for Decompressing feed

- LZO Algorithm Details:
 - a) LZO is a data compression library which is suitable for data de-/compression in real-time. This means it favors speed over compression ratio.
 - b) LZO is written in ANSI C. Both the source code and the compressed data format are designed to be portable across platforms.

LZO implements a number of algorithms with the following feature

- Decompression is simple and **very** fast.
- Requires no memory for decompression.
- Compression is pretty fast.
- Requires 64 KB of memory for compression.
- Allows you to dial up extra compression at a speed cost in the Compressor.
- The speed of the decompressor is not reduced.
- Includes compression levels for generating pre-compressed data which achieve a quite competitive compression ratio.
- There is also a compression level which needs only 8 KB for Compression.
- Algorithm is thread safe.
- Algorithm is lossless.

LZO supports overlapping compression and in-place decompression.

- c) Files required for LZO algorithm.
 - Include files, source files (src) provided by LZO
 - LZO.lib

For more information on LZO library and downloads visit:
http://www.nseindia.com/content/press/prs_whatsnew.htm#2

Specifications for utilizing on-line broadcast information

- **Decompression steps:**

- a) Receive the packet in the temporary buffer i.e. array of characters.
- b) First field will identify whether the packet is compressed or not.
- c) If this field is **0** then Decompress it using LZO algorithm else if **1** **don't** decompress it and proceed in normal way as it is being done today.
- d) The second field is packet length.
- e) The third field contains the number of records in the packet.
- f) If compressed use following function of LZO to Decompress.

```
r = lzo1z_decompress ((unsigned char *) cInputBuf,  
IpLength, (unsigned char*) cOutputBuf, OpLength, NULL);
```

lzo1z_decompress: Function which decompresses the data packet receive

CInputBuf: Input buffer in which compressed data is received

IpLength: The length of the packet which application has received using Receive ().

COutputBuf: The uncompressed output data which is result of decompression.

OpLength: Length of uncompressed data

- g) After decompression data will be available in Output Buffer.
- h) Map the outputbuf to existing Header structure according to **FN** or **FI**.
- i) Look for Record size in the length field and Code (i.e. FN or FI).
- j) Steps to recover data from OutputBuf.

Algorithm:

```
Length_of_Record = Header->length;  
Sequence_no = Header->Sequence_num;  
For I = 0 to Number of records (obtained in step 4)  
Begin  
    Bytes_to_seek = Length_of_Record * I  
    Seek to number of Bytes_to_seek  
    Map (Length_of_Record) of bytes to proper structure according  
    to iCode (FN or FI) as found in Header part.  
    Do the required processing....  
    ....  
End  
End for Loop.
```

3. DATA DETAILS

A single packet contains Header, the ASCII block of data and trailer. The interpretation of the ASCII data depends on the code field.

3.1 THE HEADER

The header consists of

- 3.1.1. **Code** – 2 char code field indicating whether the block of data is a New Update (**FN**), Market Open (**FO**), Market Close (**FC**), EOD Contract Update Addition (**FA**) and EOD Contract Update Modification (**FM**), EOD Market Information (**FS**), EOD Data End Information (**FE**), Open Interest Information (**FI**), Heartbeat Information (**FH**), Spread Order Information (**FP**) and Contract Information (**FT**). .
- 3.1.2. **Length** – 2- byte length field (Hex) indicating the length of the packet that is being sent (including header, trailer and the carriage return).
- 3.1.3. **Sequence Number** – 4- byte field indicating the sequence number (Hex) of the ASCII text being sent.

3.2 THE DATA

The following information is provided in data block -

- a) Market Open
- b) Market Close
- c) Market Update Information
- d) Market Message Information
- e) Open Interest Information
- f) EOD Contract Update Information
- g) EOD Market Information
- h) EOD Data End Information
- i) Heartbeat Information
- j) Spread Order Information
- k) Contract Information

3.3 TRAILER

The trailer is a two-byte checksum. A CR will terminate the block of data.

4. DATA STRUCTURE DETAILS

4.1. LOGIN REQUEST (send by client application)

Login Request packet will be send by the client application for login into the Infofeed application. If user wants to change his password he will specify the new password and confirm password field. Password is case sensitive. Format of this packet is as follows.

4.1.1 INFO HEADER

- | | |
|--------------------|-------------------------|
| a) Code | 'FQ' |
| b) Length | Short Integer (2 Bytes) |
| c) Sequence Number | 00 |

4.1.2 ASCII DATA

- | | |
|---------------------|----------|
| a) User Id | 10 Chars |
| b) Password | 8 Chars |
| c) New Password | 8 Chars |
| d) Confirm Password | 8 Chars |

4.1.3 INFO TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.2 LOGIN RESPONSE (send by Infofeed application)

Logon response packet will be send by the Infofeed server application after receiving the Login Request packet from the client application.

4.2.1 COM HEADER

- | | |
|----------------------|-------------------------|
| a) Compressed or Not | 1 Char |
| b) Packet Length | Short Integer (2 Bytes) |
| c) No of Packets | 1 |

4.2.2 INFO HEADER

- | | |
|--------------------|-------------------------|
| a) Code | 'FR' |
| b) Length | Short Integer (2 Bytes) |
| c) Sequence Number | 00 |

4.2.3 ASCII DATA

- | | |
|---------------|----------------|
| a) Error Code | Long (4 Bytes) |
| b) Message | 50 Chars |

4.2.4 INFO TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.3 MARKET OPEN

The Market open packet is sent when the F&O market opens for the day. The message is sent on all trading days.

HEADER

- | | |
|-----------|------|
| a) Code | 'FO' |
| b) Length | 0x0C |

c) Sequence Number XXXX

DATA

FIELD TYPE

a) Market Type

FIELD WIDTH

char 1 Byte ('N'-Normal)

TRAILER

Checksum is not computed.

4.4 MARKET CLOSE

This message is disseminated at the end of the trading hours on each trading day.

HEADER

a) Code

'FC'

b) Length

0x0C

c) Sequence Number

XXXX

DATA

FIELD TYPE

a) Market Type

FIELD WIDTH

char 1 Byte ('N'-Normal)

TRAILER

Checksum is not computed.

4.5 MARKET UPDATE INFORMATION

These packets are sent during the market hours and also in the market pre open period viz. before the actual market open. It contains the latest order and trade information of F&O contracts.

HEADER

a) Code

'FN'

b) Length

0x189

c) Sequence Number

XXXX

DATA

FIELD TYPE

1) Instrument

Char 6 Bytes

2) Symbol

Char 10 Bytes

3) Expiry date

Char 11 Bytes

4) Strike Price

Char 10 Bytes

5) Option Type

Char 2 Bytes

6) Market Type

Char 1 Byte

7) Best Buy-Order Price1

Char 10 Bytes

8) Best Buy-Order Quantity1

Char 12 Bytes

9) Best Buy-Order Price2	Char	10 Bytes
10)Best Buy-Order Quantity2	Char	12 Bytes
11)Best Buy-Order Price3	Char	10 Bytes
12)Best Buy-Order Quantity3	Char	12 Bytes
13)Best Buy-Order Price4	Char	10 Bytes
14)Best Buy-Order Quantity4	Char	12 Bytes
15)Best Buy-Order Price5	Char	10 Bytes
16)Best Buy-Order Quantity5	Char	12 Bytes
17)Best Sell-Order Price1	Char	10 Bytes
18)Best Sell-Order Quantity1	Char	12 Bytes
19)Best Sell-Order Price2	Char	10 Bytes
20)Best Sell-Order Quantity2	Char	12 Bytes
21)Best Sell-Order Price3	Char	10 Bytes
22)Best Sell-Order Quantity3	Char	12 Bytes
23)Best Sell-Order Price4	Char	10 Bytes
24)Best Sell-Order Quantity4	Char	12 Bytes
25)Best Sell-Order Price5	Char	10 Bytes
26)Best Sell-Order Quantity5	Char	12 Bytes
27)Last Traded Price	Char	10 Bytes
28)Total Traded Quantity	Char	12 Bytes
29)Security Status	Char	1 Byte
		(If Suspended "S" or Blank)
30)Opening Price	Char	10 Bytes
31)High Price	Char	10 Bytes
32)Low Price	Char	10 Bytes
33)Close Price	Char	10 Bytes
34)Average Traded Price	Char	10 Bytes
35)Total Buy Quantity	Char	12 Bytes
36)Total Sell Quantity	Char	12 Bytes
37)Total Turnover	Char	25 Bytes

TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.6. MARKET MESSAGE INFORMATION

This packet contains the messages broadcast in the market relating to corporate news or some important announcements in NSEIL's F&O market segment. They are sent during the market time and message length is variable depending on their content.

HEADER

a) Code	'FB'
b) Length	0xXX (Varies as per message length)
c) Sequence Number	XXXX

DATA

FIELD TYPE	FIELD WIDTH
a) Message Code	Char 3 Bytes (NSE)
b) Message Length	Char 3 Bytes
c) Message String	Char varies
(Variable as per message length. Maximum Length is 240 bytes)	

TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.7. OPEN INTEREST INFORMATION

This packet is sent during the trading hours and it indicates the Open Interest of the various contracts traded.

HEADER

a) Code	'FI'
b) Length	0x3D
c) Sequence Number	XXXX

DATA

FIELD TYPE	FIELD WIDTH
a) Instrument	Char 6 Bytes
b) Symbol	Char 10 Bytes
c) Expiry Date	Char 11 Bytes
d) Strike Price	Char 10 Bytes
e) Option Type	Char 2 Bytes
f) Open Interest	Char 10 Bytes
g) Market Type	Char 1 Byte

TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.8. EOD CONTRACT UPDATE INFORMATION

These packets are sent as the End of the Day feed on each trading day and this feed contains the information about the new contracts added to the F&O Market for trading.

HEADER

a) Code	'FA' or 'FM' or 'FD'
b) Length	0x7B
c) Sequence Number	XXXX

DATA

FIELD TYPE	FIELD WIDTH
a) Instrument	Char 6 Bytes
b) Symbol	Char 10 Bytes

c) Expiry Date	Char 11 Bytes
d) Strike Price	Char 10 Bytes
e) Option Type	Char 2 Bytes
f) Contract Name	Char 30 Bytes
g) Regular Lot	Char 5 Bytes
h) Market Type	Char 1 Byte ('N'-Normal)
i) Tick Size	Char 6 Bytes
j) Maturity Date	Char 11 Bytes (Format: DD-MON-YYYY)
k) Last Update Date & Time	Char 20 Bytes (Format: DD-MON-YYYY HH: MM: SS)

TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.9 EOD MARKET INFORMATION

These packets contain the End of the Day values of the contracts traded during the Trading day. This information is disseminated on every Trading day.

HEADER

a) Code	'FS'
b) Length	0xB2
c) Sequence Number	XXXX

DATA

FIELD TYPE	FIELD WIDTH
a) Instrument	Char 6 Bytes
b) Symbol	Char 10 Bytes
c) Expiry Date	Char 11 Bytes
d) Strike Price	Char 10 Bytes
e) Option Type	Char 2 Bytes
f) Market Type	Char 1 Byte ('N'-Normal)
g) Opening Price	Char 10 Bytes
h) Trade High Price	Char 10 Bytes
i) Trade Low Price	Char 10 Bytes
j) Closing Price	Char 10 Bytes
k) Last Traded Price	Char 10 Bytes
l) Previous Close Price	Char 10 Bytes
m) Settlement Price	Char 10 Bytes
n) Total Traded Quantity	Char 12 Bytes
o) Total Traded Value	Char 25 Bytes
p) Open Interest	Char 10 Bytes
q) Change in Open Interest	Char 10 Bytes

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.10 EOD DATA END INFORMATION

This packet is sent after the EOD MARKET INFORMATION feed and the EOD CONTRACT UPDATE INFORMATION feed is successfully sent to the Vendors. This packet intimates the End of EOD data.

HEADER

- | | |
|--------------------|------|
| a) Code | 'FE' |
| b) Length | 0x0B |
| c) Sequence Number | XXXX |

DATA

No data is associated with data packet.

TRAILER

Checksum is not computed.

4.11 HEARTBEAT INFORMATION

The Heartbeat packets are sent throughout the day from **8:00 am to 8.30 pm**. This packet indicates to the Info-Vendors that data packets are received from the Infofeed server (Implies that connection to Infofeed server is alive).

HEADER:

- | | |
|--------------------|------|
| a) Code | 'FH' |
| b) Length | 0x0B |
| c) Sequence Number | XXXX |

ASCII DATA:

Not associated with any ASCII data.

TRAILER:

Checksum is not computed.

4.12 SPREAD ORDER UPDATE INFORMATION

These packets are sent during the market hours and also in the market pre open period viz. before the actual market open. It contains the latest order and trade information of F&O spread contracts.

HEADER

- | | |
|--------------------|-------|
| a) Code | 'FP' |
| b) Length | 0x181 |
| c) Sequence Number | XXXX |

DATA

FIELD TYPE

- a) Instrument_1

FIELD WIDTH

Char 6 Bytes

b) Symbol_1	Char	10 Bytes
c) Expiry date_1	Char	11 Bytes
d) Strike Price_1	Char	10 Bytes
e) Option Type_1	Char	2 Bytes
f) Instrument_2	Char	6 Bytes
g) Symbol_2	Char	10 Bytes
h) Expiry date_2	Char	11 Bytes
i) Strike Price_2	Char	10 Bytes
j) Option Type_2	Char	2 Bytes
k) Best Buy-Order Price 1	Char	10 Bytes
l) Best Buy-Order Quantity1	Char	12 Bytes
m) Best Buy-Order Price 2	Char	10 Bytes
n) Best Buy-Order Quantity2	Char	12 Bytes
o) Best Buy-Order Price 3	Char	10 Bytes
p) Best Buy-Order Quantity3	Char	12 Bytes
q) Best Buy-Order Price 4	Char	10 Bytes
r) Best Buy-Order Quantity4	Char	12 Bytes
s) Best Buy-Order Price 5	Char	10 Bytes
t) Best Buy-Order Quantity5	Char	12 Bytes
u) Best Sell-Order Price 1	Char	10 Bytes
v) Best Sell-Order Quantity1	Char	12 Bytes
w) Best Sell-Order Price 2	Char	10 Bytes
x) Best Sell-Order Quantity2	Char	12 Bytes
y) Best Sell-Order Price 3	Char	10 Bytes
z) Best Sell-Order Quantity3	Char	12 Bytes
aa) Best Sell-Order Price4	Char	10 Bytes
bb) Best Sell-Order Quantity4	Char	12 Bytes
cc) Best Sell-Order Price5	Char	10 Bytes
dd) Best Sell-Order Quantity5	Char	12 Bytes
ee) Last Traded Price Difference	Char	10 Bytes
ff) Total Traded Quantity	Char	12 Bytes
gg) Opening Price Difference	Char	10 Bytes
hh) Day High Price Difference	Char	10 Bytes
ii) Day Low Price Difference	Char	10 Bytes
jj) Total Buy Quantity	Char	12 Bytes
kk) Total Sell Quantity	Char	12 Bytes

TRAILER

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.13. CONTRACT INFORMATION

These packets are sent at the beginning of the each trading day by approximately **08:45 AM**. This feed contains the information about the contracts valid in the F&O Market for trading.

HEADER

a) Code	'FT'
b) Length	0x3D
c) Sequence Number	XXXX

DATA

FIELD TYPE

- a) Token Number
- b) Instrument
- c) Symbol
- d) Expiry Date
- e) Strike Price
- f) Option Type
- g) Delete Flag

FIELD WIDTH

- Char 10 Bytes
- Char 6 Bytes
- Char 10 Bytes
- Char 11 Bytes
- Char 10 Bytes
- Char 2 Bytes
- Char 1 Bytes

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

5. CONTACT INFO

Following are the contact details for business assistance:

Name	Email Address	Contact Numbers
Mr. Ved Malla	vmalla@nse.co.in	91-22-26598385
Ms. Prachee Chavan	pracheec@nse.co.in	91-22-26598385
Mr. Pankaj Agarwal	pagarwal@nse.co.in	91-22-26598385

You can also email us on **dotex@nse.co.in**

For technical assistance email us on **infofeed_support@nse.co.in**.

6. NOTE

Security Descriptor comprises Instrument Name, Symbol, Expiry Date, Strike Price & Option Type. Symbol indicates the index on which the FUTURES or OPTIONS contract is based (viz. S&P CNX NIFTY) in case of Index Futures or Index Options or any stock (like ACC) in case of Future / Options on Individual stocks.

In the Pre-Open phase of the market, the Order Price can be 0.00. This indicates that the order placed is an At Open Order (ATO) and the actual Order Price will be calculated by the system when the market opens. Even though no trade takes place in the Pre-Open phase the Last Traded Price and the Open Price will change as the orders are placed in the system. The final open price for the security is calculated after Pre-Open period has ended. The Total Traded Quantity will be zero in the Pre-Open phase. In the Market Open phase also the Total Traded Quantity will be zero when orders are placed but no trades take place. The Last Traded Price will never be zero in the Normal Market.

7. CHECKSUM ALGORITHM

The **Checksum** routine followed for Info Vendor Feed is as follows:

```
// Following are the defines for checksum calculation
#define DC1      17
#define DC3      19
#define CR       13
#define LF       10
#define POLY     0x1021
// End of defines

unsigned check_sum (cData, iLength)
char *cData;
int iLength;
{
    unsigned uAccum = 0;
    unsigned uData;
    unsigned char ucChk [2];
    int i, j;

    for (i=0;i<iLength;i++){
        uData = *(cData+i);
        uData <<= 8;
        for (j=8; j>0; j--){
            if ((uData^uAccum)&0x8000)
                uAccum=(uAccum<<1)^POLY;
            /* SHIFT AND SUBTRACT POLY */
            else
                uAccum<<=1;
            uData<<=1;
        }
    }

    ucChk[0] = uAccum>>8;
    if (ucChk [0] == DC1 || ucChk [0] == DC3 || ucChk [0] == CR ||
ucChk[0] == LF)
        UcChk [0] -= 1;
    UcChk [1] = uAccum&0xFF;
    if (ucChk [1] == DC1 || ucChk [1] == DC3 || ucChk[1] == CR || ucChk
[1] == LF )
        UcChk [1] -= 1;
    uAccum = ucChk [1];
    uAccum = (uAccum<<8) + ucChk[0];

    return(uAccum);
}
```

8. EXAMPLE: FUNCTION FOR DECOMPRESSION

```
lzo_decomp (char cInputBuf [], unsigned int ipLength, char cOutputBuf [],
unsigned *opLength, unsigned short * lzo_errorcode)
{
    int r;
    Char mess [50];
    r = lzo1z_decompress ((unsigned char *) cInputBuf, ipLength,
                        (unsigned char *) cOutputBuf, opLength,
                        NULL);

    If ( r == LZO_E_OK)
    {
        Print (mess," Decompressed %lu bytes back into %lu bytes\n",
              (long) ipLength, (long) *opLength);

        Return true;
    }

    Else
    {
        OutputDebug ("Internal error - decompression failed");
        Return false;
    }
}
```