

PART II

OPERATIONAL PROCEDURES FOR THE GLOBAL TELECOMMUNICATION SYSTEM

EXPLANATIONS OF TERMS USED

Terms used frequently throughout this section, and their meanings, are listed below.

Meteorological information:

Meteorological information that may be in alphanumeric, binary or pictorial form.

Meteorological data

Meteorological information presented in alphanumeric or binary form.

Meteorological message

A message comprising a single meteorological bulletin, preceded by a starting line and followed by end-of-message signals

Routine meteorological message

A meteorological message transmitted according to a predetermined distribution plan

Non-routine meteorological message

A meteorological message for which there is no predetermined distribution plan.

1. OPERATIONAL PRINCIPLES FOR THE GLOBAL TELECOMMUNICATION SYSTEM

Principle 1

On the Main Telecommunication Network and the regional meteorological telecommunication networks of the Global Telecommunication System, meteorological data shall be collected, exchanged and distributed in the meteorological bulletin format.

Principle 2

The meteorological message format shall depend on the mode of operation and engineering of circuits and centres.

Principle 3

The formats of messages shall meet the requirement for automatic switching, selection and editing processes and for manual operations at telecommunication centres, and shall take account of the requirement for automatic processing of the contents of bulletins.

Principle 4

Transmission of meteorological information over the GTS shall be in accordance with agreed distribution plans.

Principle 5

Non-routine meteorological messages and service messages shall be transmitted as addressed messages.

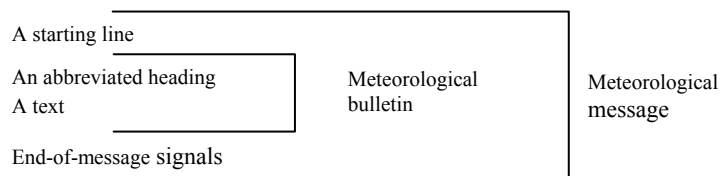
Principle 6

Scheduling of transmissions shall be made on the basis of four levels of priority.

2. OPERATIONAL PROCEDURES APPLICABLE TO THE TRANSMISSION OF METEOROLOGICAL DATA ON THE GLOBAL TELECOMMUNICATION SYSTEM

2.1 Format of meteorological messages

2.1.1 A routine meteorological message transmitted on the Global Telecommunication System shall comprise:



2.1.2 There shall be only one meteorological bulletin per meteorological message.

2.1.3 A non-routine meteorological message shall have the format of an addressed message (see 2.4 below).

2.1.4 The starting line, abbreviated heading and end-of-message signals shall be in alphanumeric form.

2.2 Alphanumeric character set used on the GTS

2.2.1 The alphabets to be used on the GTS shall be the following:

- (a) International Telegraph Alphabet No. 2;
- (b) International Alphabet No. 5.

NOTE: International Telegraph Alphabet No. 2 and International Alphabet No. 5 are reproduced in Attachments II-1 and II-2, respectively.

2.2.2 Only printed characters for which corresponding characters exist in both alphabets shall be used. The conversion shall be made in accordance with the conversion table approved for use on the GTS. The control characters from International Alphabet No. 5 which are approved for use on the GTS shall be used.

NOTE: The conversion table and the control characters from International Alphabet No. 5 which are approved for use on the GTS are given in Attachment II-3.

2.2.3 When it is required to convert characters of Alphabet No. 5 which do not appear in the conversion table (Attachment II-3) to Alphabet No. 2, the Signal No. 2 (?) in the latter alphabet shall be used.

2.2.4 International Alphabet No. 5 shall be used for the starting line, abbreviated heading and end-of-message signals of a meteorological message containing information in binary representation

2.3 Message format for routine meteorological messages

The procedures outlined below shall apply to transmission of routine meteorological messages on the GTS.

2.3.1 Starting line

2.3.1.1 The starting line shall have the following format:

(a) International Telegraph Alphabet No. 2:

$\ll \equiv \downarrow ZCZC \rightarrow \uparrow nnn \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow$

(b) International Alphabet No. 5:

S	C	C	L	nnn
O	R	R	F	
H	R	R	F	

NOTE: Examples of routine meteorological messages and the meanings of the symbols used for the signals in both International Telegraph Alphabet No. 2 and International Alphabet No. 5 are given in Attachment II-4.

2.3.1.2 The symbols have the following meanings:

nnn Transmission sequence number. It is a three-digit group giving the transmission sequence of messages from one centre over a particular channel to the receiving centre on that channel. Numbers 000 to 999 inclusive must be used in a cyclic manner. (When International Alphabet No. 5 is used, the group nnn may be a fixed combination of three characters, if agreed between the centres concerned.)

Note: A five digit-group could be used by bilateral agreement; it should be used on circuits with a speed of 64 Kbit/s or above to enable appropriate recovery procedures.

2.3.2 Abbreviated heading

2.3.2.1 The abbreviated heading shall have the following format:

(a) International Telegraph Alphabet No. 2:

$\ll \ll \equiv \downarrow T_1 T_2 A_1 A_2 \uparrow ii \rightarrow \downarrow CCCC \rightarrow \uparrow YYGGgg (\rightarrow \downarrow BBB)$

(b) International Alphabet No. 5:

C
R
C
R
L
F
T₁T₂A₁A₂ i
S
P
CCCC
S
P
YYGGgg
(
S
P
BBB
)

NOTE: Examples of routine meteorological messages and the meanings of the symbols used for the signals in both International Telegraph Alphabet No. 2 and International Alphabet No. 5 are given in Attachment II-4.

2.3.2.2 The symbols shall have the following meanings:

T₁T₂A₁A₂ii Data designators.

NOTE: The WMO standard data designators are given in Attachment II-5.

T₁T₂ Data type and/or form designators.

A₁A₂ Geographical and/or data type and/or time designators.

ii It shall be a number with two digits. When an originator or compiler of bulletins issues two or more bulletins with the same T₁T₂A₁A₂ and CCCC the ii shall be used to differentiate the bulletins and will be unique to each bulletin.

Alphanumeric bulletins containing reports prepared at the main synoptic hours for the stations included in the Regional Basic Synoptic Networks or stations included in the Regional Basic Climatological Networks shall be compiled into bulletins with ii in the series 01 to 19. This does not apply to bulletins compiled in CREX code.

Alphanumeric bulletins containing “additional” data as defined in Resolution 40 (Cg-XII) shall be compiled into bulletins with ii above 19. This does not apply to bulletins compiled in CREX code.

For some bulletins such as those compiled in GRIB, BUFR or CREX code or containing pictorial information, the use of ii is defined in the tables contained in Attachment II-5. Originators or compilers of bulletins shall use the ii values from these tables when they are defined for the purpose for which a bulletin is being intended.

For all bulletins ii shall only be used to designate “additional” data as defined in Resolution 40 (Cg-XII) if the same heading is never used for essential data and it complies with all the requirements above. If this is not the case, a unique CCCC be used as described below.

BBB An abbreviated heading defined by T₁T₂A₁A₂ ii CCCC YYGGgg shall be used only once. Consequently, if this abbreviated heading has to be used again for an addition, a correction or an amendment, it shall be mandatory to add an appropriate BBB indicator, identified by a three-letter indicator which shall be added after the date-time group.

The BBB indicator shall have the following forms

RRx for additional or subsequent issuance of bulletins;

CCx for corrections to previously relayed bulletins;

AAx for amendments to previously relayed bulletins;

where x is an alphabetic character of A through as described in Attachment II-12;

Bulletins containing observational or climatic data (surface or upper-air) from land stations will be compiled from a defined list of stations. The abbreviated headings and the contents of bulletins shall be published in WMO Publication No. 9 Volume C1 – *Catalogue of Meteorological Bulletins*

CCCC International four-letter location indicator of the station or centre originating or compiling the bulletin, as agreed internationally, and published in WMO-No. 9, Volume C1, *Catalogue of Meteorological Bulletins*.

In order to differentiate sets of bulletins that cannot be distinguished using the T₁T₂A₁A₂ii allocations, a centre may establish additional CCCCCs where the final two characters differ from its original CCCC. The two first letters of any additional CCCCCs established by a centre shall remain the same as the original CCCC. For instance, the additional CCCCCs could be used to indicate different satellites, different models or to differentiate between bulletins containing “additional” or “essential” data as defined in Resolution 40 (Cg-XII)). All CCCCCs established by any centre shall be published and defined in the (Publication No. 9, Volume C1, *Catalogue of Meteorological Bulletins*).

Once a bulletin has been originated or compiled, the CCCC must not be changed. If the contents of a bulletin is changed or recompiled for any reason, the CCCC should be changed to indicate the centre or station making the change.

YYGGgg International date-time group.

YY Day of the month.

GGgg For bulletins containing meteorological reports intended for standard times of observation, the time shall be the standard time of observation in UTC.

For aerodrome, route and area (aeronautical) forecasts: the full hour in UTC (the last two digits shall be 00) preceding the transmission time.

For other forecasts and analyses: standard time of observation in UTC on which forecast or analysis is based.

For other messages the time shall be the time of compilation in UTC.

2.3.3 Contents of meteorological bulletins

2.3.3.1 The following procedures shall apply to the compilation of the text of a meteorological bulletin:

- (a) text of a bulletin shall be in one code form only.
- (b) The text of a bulletin shall not contain both “essential” and “additional” data as defined in Resolution 40 (Cg-XII).
- (c) The text of a bulletin shall be in alphanumeric or binary representation. It shall start by the following sequence:

- (i) When International Alphabet No. 5 is used:

C	C	L
R	R	F

- (ii) When International Telegraph Alphabet No. 2 is used:

<<≡↑ or <<≡↓ as appropriate

- (d) When all the reports normally contained in a routine message are not available at the normal time of transmission, the text NIL shall be sent.

2.3.3.2 Text of meteorological bulletins in alphanumeric representation

2.3.3.2.1 Each individual meteorological report shall start at the beginning of a new line.

2.3.3.2.2 Signal No. 22 (figure case position) of the International Telegraph Alphabet No. 2 or Signal 3/13 of International Alphabet No. 5 shall be used as a meteorological report separation signal. The signal shall follow the last figure of the last group of each report, with no intervening space.

2.3.3.2.3 Format of SYNOP and SHIP bulletins

- (a) The presentation of bulletins containing SYNOP reports and SHIP reports, in the code forms FM 12–VII and FM 13–VII respectively, should be in one of the formats (a) or (b) as given in Attachment II–4, paragraph 4.

- (b) When using format (a), all Sections 1, 2, 3 and 4 shall be transmitted consecutively without any insertion of spaces and solidus in the identifier groups of Sections 3 and 4. If format (b) is used, Sections 1, 2, 3 and 4 shall start at the beginning of a line but identifiers of Sections 3 and 4 shall begin with two spaces.

NOTE: For examples of presentation of formats, see Attachment II-4.

2.3.3.2.4 In upper-air bulletins (TEMP and PILOT), each successive part (A, B, C and D) shall be preceded immediately by an alignment function (see 2.6.1 below) and followed by a separation signal. In upper-air bulletins (TEMP and PILOT), each report relating to one station is separated from the preceding report by an additional line-feed signal. Additionally, whenever Parts A and B or Parts C and D are transmitted together, they shall be separated by eight carriage return signals.

2.3.3.2.5 AMDAR and AIREP reports shall correspond to the information relating to each single point of observation during a flight.

2.3.3.2.6 Whenever practicable, and unless special provisions exist to the contrary, the text of a meteorological bulletin shall be transmitted in such a manner that full use is made of the capacity of a teleprinter line (69 characters per line).

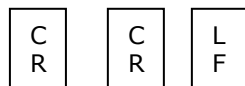
2.3.3.2.7 NIL - In the case of routine messages containing meteorological reports, NIL shall be inserted following the appropriate station index number (which should however retain its proper place in the coded message) when the report from that station is included in the published contents of the bulletin (in the Catalogue of Meteorological Bulletins and elsewhere) but is not available at the time of transmission. The same procedures also apply to other coded information (such as CLIMAT, CLIMAT TEMP).

2.3.3.2.8 The solidus (/) shall be used to indicate missing figures or letters in the text of meteorological bulletins. The solidus is represented in International Telegraph Alphabet No. 2 by the figure case position of Signal No. 24, and in International Alphabet No. 5 by Signal 2/15.

2.3.3.2.9 The procedures given above which refer to bulletins containing meteorological reports shall also apply to bulletins containing other coded information (such as TAF, CLIMAT, CLIMAT TEMP) from specified locations.

2.3.3.3 Text of meteorological bulletins in binary representation

2.3.3.3.1 The text of meteorological bulletins in binary representation shall consist of one single message and start by the sequence



followed by the code indicator coded in International Alphabet No. 5.

- 2.3.3.3.2** NIL - In the case of BUFR routine bulletins containing meteorological reports, all fields in the relevant subsets within Section 4 (Data Section) of the BUFR message, other than the station identifier and delayed replication factors, shall be set to the appropriate missing value, when the report from that station is included in the published contents of the bulletin (in the Catalogue of Meteorological Bulletins and elsewhere) but is not available at the time of transmission.

2.3.4 End-of-message signals

The format for the end-of-message signals shall be as follows:

- (a) International Telegraph Alphabet No. 2:

↓ << ≡ ≡ ≡ ≡ ≡ ≡ ≡ ≡ NNN ↓↓↓↓↓↓↓↓↓↓↓↓↓↓

NOTE: The end-of-message signals are used for ensuring page-feed and tape-feed.

- (b) International Alphabet No. 5:

C	C	L	E
R	R	F	T
			X

2.4 Addressed messages

2.4.1 Categories of addressed messages

2.4.1.1 Service messages

Priority: 1

Messages concerning the operation of the system, e.g. breakdown, resumption after breakdown, etc.

2.4.1.2 Request for GTS messages

Priority: 2

Messages used for a request for bulletins normally available on the GTS, including request for repetition.

2.4.1.3 Administrative messages

Priority: 4

Messages used for communicating between one administration and another. In exceptional circumstances a very urgent administrative message could be transmitted as a service message.

2.4.1.4 Data messages

Priority: 2

Messages consisting of meteorological data. These messages may be either replies to requests for GTS messages in the case when the reply is in the form of an addressed message, or replies to requests to databases, or data in accordance with a special agreement.

2.4.1.5 Request-to-database

Priority: 2

Messages used for a request for data addressed to a database.

2.4.2 Abbreviated headings for addressed messages

The specifications of the abbreviated headings of addressed messages are the following:

$T_1T_2A_1A_2ii C_aC_aC_aC_a YYGGgg$ (BBB)

$T_1T_2 = BM$, designator for addressed messages in alphanumeric form;

$T_1T_2 = BI$, designator for addressed messages in binary form;

$A_1A_2 =$

- AA, administrative message
- BB, service message
- RR, request of GTS messages
- RQ, request-to-database
- DA, data message

$ii = 01$

$C_aC_aC_aC_a =$ location indicator of the addressed centre

$YYGGgg =$ time of insertion on the GTS.

2.4.3 Text of addressed messages

The first line of the text of an addressed message shall contain the international location indicator of the centre originating the message. The actual content of the addressed message shall start at the second line of the text.

2.5 Requests for GTS messages

2.5.1 An existing GTS message shall be the smallest unit requested. All requests for GTS messages, and in particular requests for repetition, shall be made as soon as possible; otherwise the requested message(s) may no longer be available (see also 2.10.2.2).

2.5.2 Request messages

2.5.2.1 Requests for GTS messages shall be made by addressed message-requests for GTS messages (see 2.4.1.2, 2.4.2 for abbreviated headings and 2.4.3 for the first line of the text of the message).

2.5.2.2 The requested messages shall be identified by their abbreviated headings, and all designators shall be used to specify a particular message. One request message shall not contain more than eight requests, when addressed to a centre beyond an adjacent centre.

2.5.2.3 Each line of the text of the message shall begin with the indicator AHD (except the first line, see 2.4.3). Each line will end with the report separation signal. Each line should contain a single abbreviated heading of a requested message.

2.5.3 Request for repetition

2.5.3.1 Requests for repetition of GTS messages shall be made by addressed messages as requests for GTS messages, transmitted to the adjacent centre upstream.

2.5.3.2 In addition to the procedures for request messages as defined in 2.5.2.2 and 2.5.2.3, the messages requested for repetition may be identified in the request by their transmission sequence numbers on the circuit concerned. In this case, the second line of the text of the message shall begin with the indicator SQN, followed by the transmission sequence number or a series of sequence numbers separated by “/”, or consecutive sequence numbers (nnn – nnn).

2.5.3.3 One request-for-repetition message shall only contain a single type of identification for requested messages, i.e. abbreviated headings (see 2.5.2.3) or transmission sequence numbers (see 2.5.3.2). The maximum number of messages requested in one single request message and identified by abbreviated headings may be agreed upon on a bilateral basis between adjacent centres.

2.5.4 Replies to requests for GTS messages

2.5.4.1 A reply shall use the format for addressed data messages (see 2.4.1.4). By bilateral agreement between adjacent centres, in particular for replies to requests for repetition, replies may be made in the format of a routine message.

2.5.4.2 An addressed data message in reply to a request for GTS messages shall contain a single GTS message.

2.5.4.3 Requests shall be answered in all cases. If a requested message is not available, an addressed data message (see 2.4.1.4) shall be sent to the originator of the request with the indicator NIL followed by the identifier of the message concerned. If a request for GTS messages is incorrect, an addressed data message should be sent to the originator of the request with the indicator ERR followed by the incorrect identifier, when possible.

2.5.4.4 Replies to messages requesting repetitions shall be transmitted within 30 minutes of the filing time of the requests.

NOTE: If all the requests cannot be met at one time, the remainder of the replies may be transmitted later.

2.5.5 Requests for repetition of analogue facsimile transmissions

2.5.5.1 Requests for repetition of analogue facsimile transmissions shall be made by addressed messages (see 2.4.1.2).

2.5.5.2 A request shall contain a unique identification of the required document. The request should preferably be made in the same format as requests for meteorological messages, but using the abbreviated heading as the identifier.

2.5.5.3 Before making a request for repetition of an analogue facsimile transmission, account should be taken of probable limiting factors such as established transmission schedules and priorities of other products.

NOTE: When a point-to-point link is used, a centre requesting a repetition might indicate to the transmitting centre that the desired product could be substituted for a specified document for that one occasion.

2.5.6 Replies to requests for repetition of analogue facsimile transmissions

Before starting the repetition of an analogue facsimile transmission an addressed data message should be sent to the originator of the request indicating the expected time of repetition.

2.5.7 Acknowledgment messages

Acknowledgment procedures from a centre receiving a bulletin to its originating centre or to other centre (e.g. a relaying centre) should comply with standard GTS addressed messages (reference: paragraph 2.4 of Part II of Volume I of the *Manual on the GTS*), as very urgent administrative messages transmitted as a service message. The format for the content of an addressed message for acknowledgment of receipt of bulletin should be as follows:

```
BMBB01 CaCaCaCa YYGGgg (BBB)
CCCC
QSL TTAAii YYGGgg CoCoCoCo (BBB) (DDHHMM)
(optional text)
```

Notes:

CaCaCaCa = location indicator of the destination centre, usually the originating centre of the message being acknowledged

CCCC = international location indicator of the centre sending the acknowledgement

TTAAii CoCoCoCo YYGGgg (BBB) is the abbreviated heading of the message being acknowledged, prefixed by the word QSL

DDHHMM is the day-time group (day, hour, minute in UTC) of actual reception of the acknowledged message at the centre CCCC and is inserted when required

The third line of the text of the message is added as necessary

Example:

```
BMBB01 PHEB 051132
AMMC
QSL WEIO21 PHEB 051130 051132
```

2.6 Additional procedures applicable to both routine and addressed messages in alphanumeric form

2.6.1 Alignment function

2.6.1.1 The alignment function shall ensure correct placement of the components of messages on the page copy of teleprinters and shall consist of the following signals:

Two “carriage return”; One “line feed”.

2.6.1.2 The signals for the alignment functions shall be transmitted before each line of text.

2.6.1.3 When using International Telegraph Alphabet No. 2, in order to render ineffective any accidental shifts from figure to letter case and vice versa on transmission of the alignment function, one figure shift (Signal No. 30) or one letter shift (Signal No. 29), as appropriate, shall immediately follow the alignment function.

2.6.2 Procedures for correction

The following procedures for correction shall be applicable for both International Telegraph Alphabet No. 2 and International Alphabet No. 5:

- (a) Errors made and immediately detected during the preparation of a tape shall be corrected by backspacing the tape, where possible, and eliminating the error by overpunching the incorrect portion with the letter shift in International Telegraph Alphabet No. 2 and Signal 7/15 (DEL) in International Alphabet No. 5;
- (b) Where equipment is incapable of backspacing, corrections shall be made immediately by making the error sign: letter E and space repeated alternately three times, transmitting the last correct word or group, and then continuing with the tape preparation;
- (c) The starting line, the abbreviated heading and the end of message of a routine meteorological message shall be completely free from all telecommunication errors. Any form of correction, such as use of the error sign or overpunching of errors by use of the letter-shift character (Signal No. 29 of Alphabet No. 2), is prohibited.

2.7 Length of meteorological messages

2.7.1 The length of meteorological bulletins shall be determined according to the following:

2.7.1.1 Prior to 7 November 2007:

- (a) Any meteorological bulletin not segmented for transmission on the GTS should not exceed 15 000 octets;
- (b) Any meteorological bulletin segmented into a series of meteorological bulletins for transmission on the GTS should not exceed 250 000 octets in its original form or when reassembled.

2.7.1.2 On or after 7 November 2007:

- (a) Meteorological bulletins for alphanumeric data representation transmitted on the GTS should not exceed 15 000 octets;
- (b) The limit for meteorological bulletins for binary data representation or pictorial form shall be increased from 15 000 to 500 000 octets;
- (c) Meteorological bulletins shall no longer be segmented for transmission on the GTS.

NOTE: Meteorological information may be exchanged using the file transfer technique described in Attachment II-15, particularly when the information exceeds 250 000 octets.

2.7.2 Observational data should not be unnecessarily held up for transmission merely for the purpose of retention until a message of appropriate length can be compiled.

2.7.3 It is to be noted that, for messages that might possibly be transmitted in transit over the AFTN, the length of the text shall not exceed 200 groups.

2.8 Procedures applicable to the transmission of reports from ships and other marine stations

2.8.1 Reports from ships and other marine stations in the SHIP code form shall start with the call sign of the ship, or with a suitable alternative designator.

2.8.2 In case of ocean station vessels while on station, the indicator for the ocean station shall precede the report on a separate line.

2.8.3 In the case of mobile ships, the call sign shall be placed at the beginning of the first line of each report. If the call sign is not known, the word SHIP shall be used in its place.

2.9 Time accuracy in telecommunication centres

Each centre shall take steps to ensure that the difference between the actual time at the telecommunication centre and the universal time shall never exceed the following limits:

- (a) Thirty seconds in manual centres and automated centres using the hardware system;
- (b) Five seconds in automated centres using the software system.

2.10 Procedures relating to the telecommunication processing functions of centres

The procedures outlined below are given in the form of guidance in order that the telecommunication processing functions of centres may be executed in an efficient manner.

2.10.1 Time delays

2.10.1.1 The functions of meteorological telecommunication centres (see Part I, section 2) should include speed and alphabet conversion, procedure checking, and bulletin editing.

NOTE: The execution of these functions will take time and result in delays. The delay is defined as the interval between completion of receipt of a message and availability for retransmission on an outgoing channel.

2.10.1.2 For the automatic switching of messages the acceptable time delay should not exceed 15 seconds when no speed or alphabet conversion is involved and three minutes when speed or alphabet conversion is required.

2.10.1.3 For procedure checking, composition and editing of bulletins, the time spent by centres should be in the order of 15 seconds when only high-speed circuits are involved, and in the order of two minutes when a low-speed circuit is involved.

2.10.2 *Storage capability*

With respect to storage capability for retransmission purposes, the procedures outlined below should be applied.

2.10.2.1 Centres should store data until the onward transmission of the data to the next centre is completed. For this purpose, where the onward transmission is over a circuit on which acknowledgement procedures are used, storage of a message on a short-time access memory is required only until acknowledgement of the message is received. For circuits on which acknowledgement procedures are not used, storage of a message on a short-time access memory for 30 minutes is sufficient. Acknowledgement of reception of a message should be assumed if no request for retransmission is received within this time period.

2.10.2.2 With respect to storage capability to meet requests for messages, WMC and RTHs should store messages they exchange over the GTS for a period of 24 hours.

2.10.3 **Routeing catalogues**

2.10.3.1 The procedures described here are recommended for the exchange of the routeing catalogues of GTS Centres. The routeing catalogue is exchanged in the form of a file which can be directly ingested into most database software packages to help in GTS data flow analysis. The files containing “routeing catalogues” should be obtained using FTP file transfer over the Internet where possible and should be either available at each Centre or from the WMO server. The WMO server should contain a list (with hyperlinks) of all Centres who have routeing catalogues available for exchange. All Centres should provide the WMO Secretariat with URL addresses of where their respective files are located.

2.10.3.2 The routeing catalogue of a GTS centre should provide the following information for each bulletin identified by its abbreviated heading TTAAii CCCC:

- (a) The GTS circuit on which the bulletin is received;
- (b) The list of the GTS circuits on which the bulletin is sent.

2.10.3.3 Each RTH should prepare a routeing catalogue and make it accessible by the other GTS centres, in particular by its associated NMCs. The routeing directory should be updated monthly if possible, but not less than every three months.

2.10.3.4 A GTS centre should include in its routeing catalogue the abbreviated headings of all bulletins received and/or transmitted on any GTS circuit connected to this GTS centre (GTS point-to-point circuits, GTS point-to-multipoint circuits such as satellite distribution systems, including the remaining HF broadcasts). Any bulletin scheduled to be received by the GTS centre, even if not actually forwarded on the GTS, should be included in the routeing catalogue.

2.10.3.5 The bulletins received and/or transmitted on a circuit established under a bilateral agreement for meteorological data exchange should also be included in the routing catalogue.

2.10.3.6 The format of the routing catalogue and the procedures for the access to the routing catalogues are given in the Attachment II-7.

2.10.4 Review of the content of switching directories

In addition to the regular updating of the switching directories, all automated GTS centres should clean regularly (e.g. once every six months) their switching directories thereby removing all abbreviated headings of bulletins which are no longer expected for exchange on the GTS.

2.11 Procedures for store-and-forward data transmissions

2.11.1 Priorities for store-and-forward data transmission

2.11.1.1 The messages shall be forwarded on the basis of four levels of priority. The level of priority shall be allocated according to the data type (T_1, T_2) and is indicated in Table A of Attachment II-5.

2.11.1.2 Within a level of priority, the messages shall be forwarded according to the “first in, first out” principle.

2.11.1.3 The messages of a higher level of priority shall be forwarded before those of a lower level of priority. However, the forwarding of a message of a higher level of priority shall not interrupt the transmission of a message already started.

2.11.2 Detection and cancellation of duplicated messages

Duplicated messages received within at least three hours of the original message should be detected and eliminated.

2.12 Data communication protocols for the Global Telecommunication System

2.12.1 The transmission protocols for use on the GTS shall be elements of procedures as specified in ITU-T Recommendation X.25 and the Transmission Control Protocol/Internet Protocol (TCP/IP).

2.12.2 ITU-T Recommendation X.25 procedures

The methods and elements of ITU-T Recommendation X.25 procedures to be used in the GTS are as outlined below, and are given in Attachment II-13.

NOTE: References to OSI layers are taken from the Reference Model of Open Systems Interconnection (OSI) given in International Standard ISO 7498 and ITU-T Recommendation X.200.

2.12.2.1 Physical layer (ITU-T Recommendation X.25, physical layer, paragraph 1/OSI layer 1)

The provisions given in ITU-T Recommendation X.25, paragraph 1, shall be applied to point-to-point circuits and the interface between the data terminal equipment (DTE) and data circuit terminating equipment (DCE).

2.12.2.2 Link layer (ITU-T Recommendation X.25, data link layer, paragraph 2/OSI layer 2)

The following provisions shall be applicable only point-to-point circuits between centres of the GTS

Frame structure: The frame format shall be as described in Table 1/X.25, with the following parameters:

Address field: one octet; Control field: one octet.

NOTE: The extended control field of two octets or more needs further study.

Information field: 259 octets, 131 octets optional subject to bilateral agreement between centres concerned.

Elements of procedure: The elements of procedure shall be as described in section 2.3, "LAPB elements of procedures", of ITU-T Recommendation X.25.

Description of the procedures: The description of the procedures shall be as described in section 2.4, "Description of the LAPB procedures", of ITU-T Recommendation X.25.

It is recommended that WMCs and RTHs should take the role of DTE or DCE and NMCs should take the role of DTE, by bilateral agreement between centres concerned.

System parameters shall be as follows:

Timer T1 : $T1 >$ Transmission time for three frames + two-way signal propagation time over the link + maximum time for processing one frame in a specific receiving centre.

NOTE: Examples of values of Timer T1 with processing time of ten milliseconds are as follows:

Cable links: 9600 bit/s: 0.4 s	4800 bit/s: 0.8 s	2400 bit/s: 1.6 s
Satellite links: 9600 bit/s: 1.2 s	4800 bit/s: 1.6 s	2400 bit/s: 2.4 s

Maximum number of transmissions N2:10

Number of outstanding frames k : $2 \leq k \leq 7$

NOTE: International Standard ISO 7776 — Information processing systems — Data communication — High-level data link control procedures — Description of the X.25 LAPB-compatible DTE data link procedures, describes the X.25 layer 2 procedures as viewed by the DTE for DTE to DCE operation and for DTE to DTE operation without an intervening packet-switched network.

2.12.2.3 Network layer (ITU-T Recommendation X.25, packet layer, sections 3, 4, 5.1 to 5.5/OSI layer 3)

The packet layer of ITU-T Recommendation X.25 shall be used in accordance with the procedures for permanent virtual circuit (PVC) and virtual call (VC) services.

The maximum length of the user data field shall be 256 octets or optionally 128 octets.

Window size W : $2 \leq W \leq 7$ depending on type of communication circuit and system equipment.

One or more logical channels (PVC and/or VC) should be established between two adjacent centres. Multiplexing provided by logical channels (PVCs and/or VCs) should be used in preference to multiplexing provided at the physical layer (e.g. by V.29 modems). The recommended procedures for the use of VCs — also called switched virtual circuits (SVCs) — are given in Attachment II-14.

NOTE: One or more PVC and/or VC could be used between non-adjacent centres by multilateral agreement.

When the transport layer procedures have not been implemented, “more data mark” (binary element M) shall be used to identify the sequence of packets containing the complete message.

NOTE: International Standard ISO 8208 — Information processing systems — Data communication — X.25 Packet layer protocol for data terminal equipment, describes the X.25 packet layer procedures as viewed by the DTE for DTE to DCE operation and for DTE to DTE operation without an intervening packet-switched network.

2.12.2.4 Transport layer (OSI layer 4)

A transport protocol should be employed in accordance with ITU-T Recommendation X.224. When implemented, the class 2 procedures, including those for multiplexing, explicit flow control and expedited data transfer, shall be used. Class 3 or 4 transport protocol may be provided in addition to class 2, when and where considered appropriate.

2.12.3 TCP/IP protocol

The recommended practices and procedures for the implementation, use and application of the Transmission Control Protocol/Internet Protocol (TCP/IP) on the GTS are as given in Attachment II.15.

2.13 Transmission and collection of meteorological bulletins on the Internet

The Internet may be used for transmitting and collecting meteorological bulletins on the Internet. The purpose is to serve as a complementary communication system to be used in test and special cases, or when a dedicated GTS link is unavailable. The practices for electronic mail (e-mail) and/or Web data ingest as given in Attachment II-16 should be used with a view to minimizing inherent security risks.

2.14 Supplementary procedures applicable to radioteleprinter transmissions

In addition to the general telecommunication procedures given above, there are special procedures applicable to radioteleprinter transmissions.

2.14.1 Identification

A radioteleprinter broadcast shall be preceded by the transmission of call signals.

2.14.1.1 The call signals shall comprise: the general call to all stations (transmitted three times), the conventional signal DE, the identification of the broadcasting station, consisting of the radio call sign followed

by the frequency reference index or indices (transmitted three times), and the letters RY repeated without separation for one line (69 characters).

Example:

CQ CQ CQ DE WSY21/22 WSY21/22 WSY21/22
 RYRY -----RYRYRYR
 ←----- 69 characters -----→

2.14.1.2 **Transmission of call signals**

Call signals shall be transmitted:

- (a) For at least the two minutes preceding the official starting time of broadcasts that begin at a fixed time;
- (b) Each time the station has no traffic during assigned broadcast periods;
- (c) For the five minutes preceding the first broadcast following a change of frequency.

2.14.2 **Special procedures for relay centres**

2.14.2.1 In radioteletype exchanges where a communication centre is responsible for the relay of bulletins originating from another centre, the abbreviated heading shall not be altered when the bulletin is retransmitted.

2.14.2.2 When a message is received with some of the text garbled, the relay centre shall retransmit the message as received and, if possible, obtain a retransmission from the originating centre.

2.14.2.3 National instructions should cover the case of the measures to be taken when extensive garbling occurs, in order to ensure that all usable data are relayed with the minimum delay and with the elimination, where possible, of completely garbled portions. Whenever elimination of part of the text is performed, the abbreviation INC should be added at the end to indicate that the bulletin is incomplete; the relay centre should take all necessary steps to receive from the originating centre those parts of the bulletin which were garbled and retransmit them as soon as possible.

3. **PROCEDURES APPLICABLE TO THE TRANSMISSION OF METEOROLOGICAL INFORMATION IN PICTORIAL FORM OVER THE GLOBAL TELECOMMUNICATION SYSTEM**

3.1 **Format of meteorological information in pictorial form**

The details which should appear in the panel for identification of pictorial information (to be placed in the lower left-hand corner of the chart and also, if possible, in the upper right-hand corner) are determined nationally. They should be easy to identify, read and understand and should therefore include at least the abbreviated heading of the pictorial information.

3.2 Requirements for relay of facsimile (analogue) transmissions

3.2.1 The relay of facsimile (analogue) transmissions should be accomplished by store-and-forward operation or by direct transmission (through-switching) of the signals.

3.2.2 In all cases, the relay of facsimile transmissions should be accomplished with the minimum possible delay.

3.2.3 High-quality recording/storage devices, such as magnetic tape recorders, should be used in the store-and-forward system of analogue facsimile relay in order to maintain the picture quality throughout the storage and retransmission process. All the technical transmission characteristics specified in Part III, section 5 shall be maintained during the store-and-forward procedure.

3.2.4 At some centres facsimile storage may be possible and convenient using a computer equipped with analogue/ digital conversion of received signals and digital/analogue reversion for relayed signals.

3.2.5 In some cases the transmission of facsimile signals in analogue form could be performed without storage in relay centres, thereby providing a minimum delay in transit through several consecutive segments of a telecommunication network.

3.2.6 Centres not equipped to perform the store-and-forward operation within three minutes, nor for direct through-switching transmission, shall provide adequate storage, using a conventional magnetic tape system or equivalent methods, to accommodate the facsimile (analogue) relay transmissions. The storage shall be sufficient for at least one complete frame.

3.2.7 For emergency back-up purposes only, page copy from chart recorders should be used to facilitate the store-and-forward mode of operation.

3.3 Periodic transmission of the WMO test chart

The WMO standardized test chart should be transmitted periodically, in accordance with requests made, on all parts of the GTS for which facsimile (analogue) transmissions are regularly provided.

NOTE: The WMO standardized test chart is given in Attachment II-8.

3.4 Coded and non-coded digital facsimile transmission procedures

Coded or non-coded digital facsimile transmission should be carried out by one of the following procedures:

- (a) Alphanumeric data and digital facsimile information should be transmitted, on a time-sharing basis, on a single data link;
- (b) Alphanumeric data and digital facsimile information should be transmitted on separate channels, multiplexed by a modem in accordance with ITU-T Recommendation V.29.

NOTE: The procedures to be applied are given in Attachment II-9.

4. QUALITY OF METEOROLOGICAL TRANSMISSIONS

4.1 Monitoring and control

All transmissions of meteorological information shall be monitored periodically by the originator to ensure adherence to the recommended procedures and specifications, thereby permitting satisfactory performance of the GTS.

4.2 Reports of reception conditions

4.2.1 The code form RECEP shall be used for the reporting of reception conditions of meteorological radio transmissions.

NOTE: The code form RECEP is given in Attachment II-10.

4.2.2 Reports of reception conditions shall be made periodically by recipients to the originators of the radio transmissions.

5. PROCEDURES FOR AMENDING WMO PUBLICATIONS AND METHODS OF NOTIFICATION

5.1 Responsibility for notification of amendments

Information for WMO publications shall be kept current. Notification of amendments shall be sent to the Secretariat at least two months in advance of the effective date of the change.

5.2 METNO and WIFMA

5.2.1 The code name METNO shall be used to identify messages concerning information relating to WMO Publication No. 9, Volumes A (Observing stations) and C (Catalogue of meteorological bulletins and transmissions schedules); the code name WIFMA shall be used to identify messages concerning information relating to WMO Publication No. 9, Volume D (Information for shipping). METNO messages shall also contain, as appropriate, information on important changes in international meteorological codes and telecommunication procedures.

NOTE: METNO and WIFMA messages issued by the Secretariat will provide advance notification of changes in WMO Publication No. 9, Volumes A, C and D, in addition to the normal supplement service.

5.2.2 METNO and WIFMA messages shall be transmitted from Geneva to Zurich and thence to the associated RTH for global dissemination through the Global Telecommunication System.

5.2.3 METNO and WIFMA messages shall be compiled in the standard format for routine meteorological messages using the abbreviated heading NOXX02 LSSW for changes related to Volume C1 - *Catalogue of Meteorological Bulletins* - of WMO Publication No. 9 and NOXX01 LSSW for the changes to the other Volumes of WMO Publication No. 9.

