Interface Specification for

MADOCA-SEAD

Japan Aerospace Exploration Agency

revB : July 2019

revA : February 2017

NC : October 2016

Preface

JAXA develops the tool to estimate Multi-GNSS orbit and clock precisely, called “MADOCA (Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis)”, and provides the estimated products, called “MADOCA-products”, from “MADOCA-SEAD(Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis Supply of “MADOCA-PPP”-Enabled Advanced Demonstration system).

This document describes the data interface specification required by MADOCA-products Users.

In addition, there is no technical change from IS-QZSS Version 1.7.

Disclaimer

JAXA pays close attention from every aspect, but does not guarantee any availability and precision of the product. JAXA also assumes no responsibility for any damages occurring when a MADOCA-products user uses a product. JAXA may interrupt, stop and terminate product distribution. Notice that JAXA bears no responsibility for any resulting damages of a MADOCA-products user.

Revision Recode

Code	Date	Description
NC	October 2016	Initial release (No Change)
A	February 2017	Chage of Message Type for FCB(Table 4.1-1, 4.2.3-1, Table 5.5-1～5.5-4) Correction of the definition about “the Number of QZSS Satelltes” (Table 4.1-1, 5.1-2, 5.2-2, 5.3-2, 5.4-2, 5.5-2) Clarification of the definition about “UDI” (Table 5.1-1～5.5-4) Correction of erroneous description (Table 5.2-4)
B	July 2019	Additional notes on applicable documents (2.1) Deletion of description about MADOCA product via Satellite (4.2.3, 4.2.4) Addition of Quasi-Zenith Satellite Information at the time of B revision establishment (5.1(2)) Update of description about MADOCA-SEAD system(Fig 3-1, Chap 4, Table 5.1-1 ~ 5.5-4) Clarification of MADOCA undefined data field. (Table 5.5-1 ~ 5.5-4)

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1. Scope

This interface specification, called “IS-MADOCA-SEAD”, presents the overview of MADOCA-SEAD (Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis Supply of “MADOCA-PPP”-Enabled Advanced Demonstration system) and an data interface required by the MADOCA-products Users.

2. Documents

2.1 Applicable Documents

(1) Japan Aerospace Exploration Agency, “Interface Specification of QZSS”, ver.1.8,(TBD) 2016.

(2)RTCM SPECIAL COMMITTEE NO. 104, RTCM Paper 228-2013-SC104-STD, RTCM STANDARD 10403.2 DIFFERENTIAL GNSS (GLOBAL NAVIGATION SATELLITE SYSTEMS) SERVICES – VERSION 3 with Amendment 2, Nov, 2013.

(3) RTCM SPECIAL COMMITTEE NO. 104, RTCM Paper 107-2014-SC104-818, Proposal of new RTCM SSR Messages SSR Stage 1: Galileo, QZSS, SBAS. BDS for RTCM STANDARD 10403.2, v.6, May, 2014.

(4) RTCM SPECIAL COMMITTEE NO. 104, Proposal of new RTCM SSR Messages SSR Stage 2: Satellite Phase Biases for RTCM STANDARD 10403.2, v.5, April, 2014.

(5) RTCM STANDARD 10410.1 NETWORKED TRANSPORT OF RTCM via INTERNET PROTOCOL (Ntrip) - Version 2.0, June, 2011.

* Above RTCM format documents are published for a fee by RTCM. Draft versions are published ONLY to RTCM members.

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2.2 pReference Documents

(1) M. Ge et al., Resolution of GPS carrier-phase ambiguities in Precise Point Positioning (PPP) with daily observation, J Geod., 2008.

3. Overview of MADOCA-SEAD

MADOCA-SEAD is the demonstration system for the precise positioning using the precise information of the satellite orbit and clock. This system estimates the orbit and clock of Multi-GNSS, such as GPS, QZS, GLONASS, Galileo and BeiDou, precisely and provides the estimated products as the correction information for satellite navigation message, called “MADOCA-products”. Figure 3-1 shows the overview of MADOCA-SEAD system.

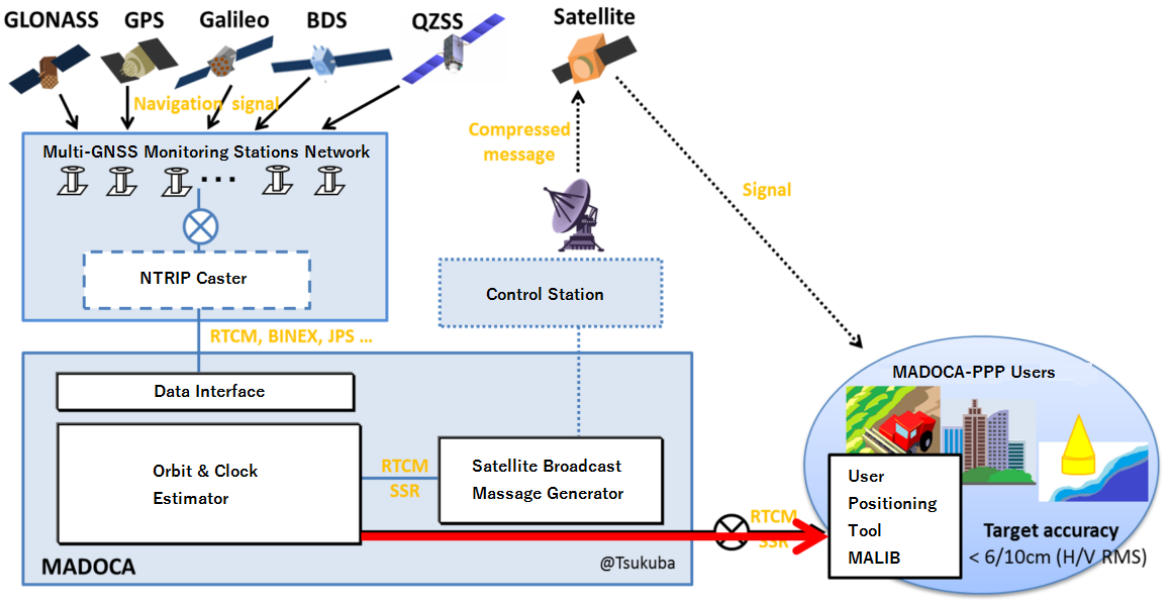

Figure 3-1 Overview of MADOCA-SEAD System

4. Published Products

The MADOCA-SEAD can provide the MADOCA-products as the following;

(1)Via Internet

MADOCA-products follow the international standard format “RTCM10403.2” (Reference: Applicable Documents(2),(3),(4)) basically and use NTRIP Protocol (Reference: Applicable Document(5)).

(2)Via Satellite

MADOCA-SEAD can store the MADOCA-products to the low-rate format based on the international standard format “RTCM10403.2” (Reference: Applicable Documents(2),(3),(4))

(3)On FTP Server

MADOCA-products follow the international standard format “RTCM10403.2” (Reference: Applicable Documents(2),(3),(4)) or SP3c format and are published on the JAXA’s FTP server.

4.1 Via Internet

4.1.1 Protocol

MADOCA-SEAD adopts NTRIP protocol. Please refer to the Applicable Document(5) for the details.

4.1.2 Format

MADOCA-SEAD adopts the “RTCM SSR(State Space Representation)” in the international standard format “RTCM10403.2” except for some messages (Reference: Table 4.1-1 Note 5). In the RTCM SSR format, “Message Type Number” is defined for each correction information type, such as the orbit , clock, URA or code biases and MADOCA-products Users can receive only their required information. Table 4.1-1 shows the list of message type number provided from MADOCA-SEAD. Please refer to Applicable Documents(2),(3),(4) and the section 5 in this document for the details.

4.1.3 Considerations for Use

(1)Handling of SSR-IOD Value

The MADOCA-products are provided as the correction information for Satellite Navigation Message. IODE value, which indicates the corrected Satellite Navigation Message, is included only in the SSR Orbit Correction Message (Reference: Table 4.1-1) and the other SSR Messages are linked by “SSR-IOD”, which is incremented when the estimation of orbit and clock is updated. So, MADOCA-products Users should use the SSR Messages of the same SSR-IOD value. Please refer to the applicable documents(2),(3),(4) for the details.

Table 4.1-1 List of Message type number provided from MADOCA-SEAD

No.	Message Type Number	Message Name	No. of bits	Remarks
1	1057	SSR GPS Orbit Correction	68＋135×NS※2	
2	1059	SSR GPS Code Bias	67＋11×NS※2＋19×ΣNCB※3	
3	1061	SSR GPS URA	67＋12×NS※2	
4	1062	SSR GPS High Rate Clock Correction	67＋28×NS※2	
5	1063	SSR GLONASS Orbit Correction	65＋134×NS※2	
6	1065	SSR GLONASS Code Bias	64＋10×NS※2＋19×ΣNCB※3	
7	1067	SSR GLONASS URA	64＋11×NS※2	
8	1068	SSR GLONASS High Rate Clock Correction	64＋27×NS※2	
9	1240※1	SSR GALILEO Orbit Correction	68＋137×NS※2	
10	1242※1	SSR GALILEO Code Bias	67＋11×NS※2＋19×ΣNCB※3	
11	1244※1	SSR GALILEO URA	67＋12×NS※2	
12	1245※1	SSR GALILEO High Rate Clock Correction	67＋28×NS※2	
13	1246※1	SSR QZSS Orbit Correction	66※6＋133×NS※2	
14	1248※1	SSR QZSS Code Bias	65※6＋9×NS※2＋19×ΣNCB※3	
15	1250※1	SSR QZSS URA	65※6＋10×NS※2	
16	1251※1	SSR QZSS High Rate Clock Correction	65※6＋26×NS※2	
17	1258※1	SSR BDS Orbit Correction	68＋161×NS※2	
18	1260※1	SSR BDS Code Bias	67＋11×NS※2＋19×ΣNCB※3	
19	1262※1	SSR BDS URA	67＋12×NS※2	
20	1263※1	SSR BDS High Rate Clock Correction	67＋28×NS※2	
21	11※5	SSR GPS Carrier Phase Bias	69＋28×NS※2＋49×ΣNPB※4	
22	12※5	SSR GALILEO Carrier Phase Bias	69＋28×NS※2＋49×ΣNPB※4	
23	13※5	SSR QZSS Carrier Phase Bias	67※6＋26×NS※2＋49×ΣNPB※4	
24	14※5	SSR BDS Carrier Phase Bias	69＋28×NS※2＋49×ΣNPB※4	

※1 Defined in the RTCM draft version format (Reference: Applicable Document(3)).

※2 NS：The number of satellites.

※3 NCB：The number of Code Biases per individual satellite.

※4 NPB：The number of Carrier Phase Biases per individual satellite. MADOCA-SEAD provides Carrier Phase Biases per each frequency of individual satellite.

※5 Carrier Phase Biases are provided in the original format based on RTCM draft version format (Reference: Applicable Document(4)). As of September 2016, JAXA uses 2065, 2067, 2068 and 2070 as the message type number for Carrier Phase Biases of GPS, GALILEO, QZSS and BDS. However, in order to avoid the duplication of these message type numbers with RTCM official message type number defined in the future, these message type numbers is changed to the different numbers (11, 12, 13 and 14: reserved for experimental use in RTCM official format) in Feburuary 2017.

※6 4 bits are assigned to the DF for “the number of QZSS satellites”. In tihe future, the No of bits for this DF will be changed to “6 bits” in order to follow RTCM official message.

4.2 Via Satellite

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MADOCA-SEAD can provide MADOCA-products at low data rate..

4.2.1 MADOCA-LEX Signal Property

N/A

4.2.2 MADOCA-LEX Structure

4.2.2.1 LEX Message Structure

N/A

4.2.2.2 Compact massage format

Figure 4.2.2-3 shows compact massage format data section structure.

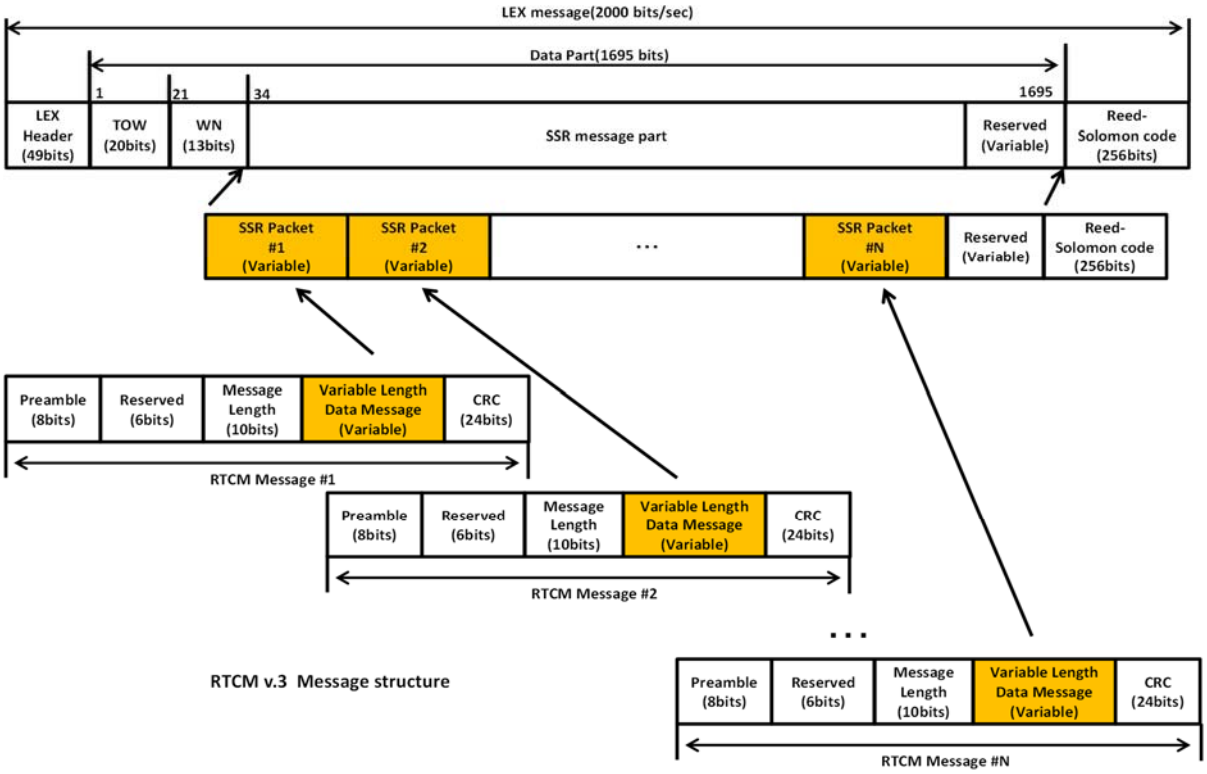

Figure 4.2.2-3 Compact message format

(1) TOW count

The 20-bit Time of Week (TOW) count at the beginning of the data section indicates the time (seconds into week) at the beginning of the next one-second message. The valid range is from 0 to 604799. The TOW in the last message of the week is set to “0” and the TOW in the first message of the week is set to “1”.

(2) Transmission Week No (WN)

The 13 bits from bit 21 to bit 33 in the data section constitute a binary expression for the modulo-8192 GPS Week Number at the start of that message.

(3) SSR message part

The rest bits in data section from bit 34 to bit 1695 store some MADOCA-products based on RTCM SSR format and the transmitted messages are almost the same as via internet (Reference: Table 4.1-1 and Table 4.2.3-1). Only the “SSR Variable Length Data Message” part of each RTCM SSR message is stored and the other parts (preamble, reserved section, RTCM SSR message length and CRC) is NOT stored to reduce the amount of data. And the blank bits are set to “0”.

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4.2.3 Update Interval

N/A

4.2.4 Considerations for Use

N/A

4.3 Published Site

MADOCA Products are published on JAXA's WEB site. The type of published MADOCA Products are shown in Table 4.3-1.

Table 4.3-1 Published MADOCA Products

Product Type	Format	Upload
MADOCA Real Time Products	・RTCM SSR format (Reference: Applicable Documents(2), (3),(4) and Section 5) ・SP3c format	WEB
MADOCA Offline Products - Final - Rapid - Ultra Rapid	・SP3c format	WEB

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5 Data Format

5.1 SSR Orbit Correction Messages

The contents of SSR Orbit Correction Messages for GPS, GLONASS, QZSS, GALILEO and BDS are shown from Table 5.1-1 to Table 5.1-5. The content and format of them follows RTCM SSR format (Reference: Applicable Documents(2),(3)). A symbol beginning with "DF" in the column "Remarks" indicates “Data Field” defined in RTCM format. The update interval of the correction massage is published on the website(http://mgmds01.tksc.jaxa.jp). B

(1)GPS (Message Type Number: 1057)

The contents of SSR GPS Orbit Correction Messages are shown in Table 5.1-1.

Table 5.1-1 SSR GPS Orbit Correction Messages (Message Type Number: 1057)

#	Name	Data Type	No. of Bits	Possible Range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1057)	DF002
2	GPS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	GPS reference time (Full seconds since the beginning of the GPS week)	DF385
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391 B
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	Satellite Reference Datum	bit (1)	1	0 or 1	Orbit corrections refer to Satellite Reference Datum (0:ITRF, 1:Regional)	DF375
6	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
7	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
8	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
9	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #9)		68			
#10 ~ #17 are repeated for each satellites (1 ~ NS (No. of Satellites))						
10	GPS Satellite ID	uint 6	6	1 ~ 32	GPS Satellite ID	DF068
11	GPS IODE	uint 8	8	–	IODE value of broadcast ephemeris used for calculation of Correction Differences.	DF071

12	Delta Radial	int 22	22	±209.7151[m]	Radial orbit correction for broadcast ephemeris.	Resolution: 0.1[mm] DF365
13	Delta Along Track	int 20	20	±209.7148[m]	Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF366
14	Delta Cross-Track	int 20	20	±209.7148[m]	Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF367
15	Dot Delta Radial	int 21	21	±1.048575[m/s]	Velocity of Radial orbit correction for broadcast ephemeris.	Resolution: 0.001[mm/s] DF368
16	Dot Delta Along- Track	int 19	19	±1.048572[m/s]	Velocity of Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF369
17	Dot Delta Cross- Track	int 19	19	±1.048572[m/s]	Velocity of Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF370
	Subtotal(#10 ~ #17)		135			
	Total	68 + 135 × NS				

(2) QZSS (Message Type Number: 1246)

The contents of SSR QZSS Orbit Correction Messages are shown in Table 5.1-2.

Table 5.1-2 SSR QZSS Orbit Correction Messages (Message Type Number: 1246)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1246)	DF002
2	QZSS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	QZSS Reference time (Full seconds since the beginning of the GPS week)	DF460※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	Satellite Reference Datum	bit (1)	1	0 or 1	Orbit corrections refer to Satellite Reference Datum (0:ITRF, 1:Regional)	DF375
6	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
7	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
8	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
9	No. of Satellites	uint 4	4	0 ~ 15	Number of Satellites included in the message	Original DF
	Subtotal (#1 ~ #9)		66			
#10 ~ #17 are repeated for each satellites (1 ~ NS (No. of Satellites))						
10	QZSS Satellite ID	uint 4	4	1 ~ 10	QZSS Satellite ID※2	DF429
11	QZSS IODE	uint 8	8	0 ~ 255	IODE value of broadcast ephemeris used for calculation of Correction Differences.	DF434
12	Delta Radial	int 22	22	±209.7151[m]	Radial orbit correction for broadcast ephemeris.	Resolution: 0.1[mm] DF365
13	Delta Along Track	int 20	20	±209.7148[m]	Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF366

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14	Delta Cross-Track	int 20	20	±209.7148[m]	Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF367
15	Dot Delta Radial	int 21	21	±1.048575[m/s]	Velocity of Radial orbit correction for broadcast ephemeris.	Resolution: 0.001[mm/s] DF368
16	Dot Delta Along- Track	int 19	19	±1.048572[m/s]	Velocity of Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF369
17	Dot Delta Cross- Track	int 19	19	±1.048572[m/s]	Velocity of Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF370
	Subtotal (#10~#17)		133			
	Total	66 + 133 × NS				

※1 Defined in draft version of RTCM (Refer to Applicable Document(3)).

※2 QZSS satellite ID is defined as below; (This information is as of revB establishment. For the latest information, Refer to PS/IS-QZSS documents published by the Cabinet Office.)

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QZSS Satellite ID

ID	QZSS Satellite PRN	
	PRN number	Satellite name
1	193	QZS-1
2	194	QZS-2
3	195	QZS-4
4	196	-
5	197	-
6	198	-
7	199	QZS-3
8	200	-
9	201	-
10	202	-

(3) GALILEO (Message Type Number: 1240)

The contents of SSR GALILEO Orbit Correction Messages are shown in Table 5.1-3.

Table 5.1-3 SSR GALILEO Orbit Correction Messages (Message Type Number: 1240)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 – 4095	SSR Message Type Number (Value:1240)	DF002
2	GALILEO Epoch Time 1s	uint 20	20	0 – 604799[s]	GALILEO Reference time(Full seconds since the beginning of the GALILEO week)	DF458※1
3	SSR Update Interval	bit (4)	4	0 – 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	Satellite Reference Datum	bit (1)	1	0 or 1	Orbit corrections refer to Satellite Reference Datum (0:ITRF, 1:Regional)	DF375
6	IOD SSR	uint 4	4	0 – 15	Issue Of Data number for SSR in this message.	DF413
7	SSR Provider ID	uint 16	16	0 – 65535	SSR Provider ID number	DF414
8	SSR Solution ID	uint 4	4	0 – 15	SSR Solution ID number	DF415
9	No. of Satellites	uint 6	6	0 – 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #9)		68			
#10 ~ #17 are repeated for each satellites (1 ~ NS (No. of Satellites))						
10	GALILEO Satellite ID	uint 6	6	0 – 63	GALILEO Satellite ID	DF252
11	GALILEO IODnav I/NAV	uint 10	10	0 – 1023	IODE value of broadcast ephemeris used for calculation of Correction Differences.	DF459※1
12	Delta Radial	int 22	22	±209.7151[m]	Radial orbit correction for broadcast ephemeris.	Resolution: 0.1[mm] DF365
13	Delta Along Track	int 20	20	±209.7148[m]	Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF366
14	Delta Cross-Track	int 20	20	±209.7148[m]	Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF367

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15	Dot Delta Radial	int 21	21	±1.048575[m/s]	Velocity of Radial orbit correction for broadcast ephemeris.	Resolution: 0.001[mm/s] DF368
16	Dot Delta Along- Track	int 19	19	±1.048572[m/s]	Velocity of Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF369
17	Dot Delta Cross- Track	int 19	19	±1.048572[m/s]	Velocity of Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF370
	Subtotal(#10～#17)		137			
	Total	68 ＋ 137 × NS				

※1 Defined in draft version of RTCM (Refer to Applicable Document(3)).

(4) GLONASS (Message Type Number: 1063)

The contents of SSR GLONASS Orbit Correction Messages are shown in Table 5.1-4.

Table 5.1-4 SSR GLONASS Orbit Correction Messages (Message Type Number: 1057)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 – 4095	SSR Message Type Number (Value:1057)	DF002
2	GLONASS Epoch Time 1s	uint 17	17	0 – 86399 [s]	GLONASS reference time (Full seconds since the beginning of the GLONASS day)	DF386
3	SSR Update Interval	bit (4)	4	0 – 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	Satellite Reference Datum	bit(1)	1	0 or 1	Orbit corrections refer to Satellite Reference Datum (0:ITRF, 1:Regional)	DF375
6	IOD SSR	uint 4	4	0 – 15	Issue Of Data number for SSR in this message.	DF413
7	SSR Provider ID	uint 16	16	0 – 65535	SSR Provider ID number	DF414
8	SSR Solution ID	uint 4	4	0 – 15	SSR Solution ID number	DF415
9	No. of Satellites	uint 6	6	0 – 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #9)		65			
#10 ~ #17 are repeated for each satellites (1 ~ NS (No. of Satellites))						
10	GLONASS Satellite ID	uint 5	5	1 – 24	GLONASS Satellite ID	DF384
11	GLONASS IOD	uint 8	8	0 – 255	IODE value of broadcast ephemeris used for calculation of Correction Differences.	DF392
12	Delta Radial	int 22	22	±209.7151[m]	Radial orbit correction for broadcast ephemeris.	Resolution: 0.1[mm] DF365

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13	Delta Along Track	int 20	20	±209.7148[m]	Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF366
14	Delta Cross-Track	int 20	20	±209.7148[m]	Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF367
15	Dot Delta Radial	int 21	21	±1.048575[m/s]	Velocity of Radial orbit correction for broadcast ephemeris.	Resolution: 0.001[mm/s] DF368
16	Dot Delta Along- Track	int 19	19	±1.048572[m/s]	Velocity of Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF369
17	Dot Delta Cross- Track	int 19	19	±1.048572[m/s]	Velocity of Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF370
	Subtotal (#10~#17)		134			
	Total		65 + 134×NS			

(5) BDS (Message Type Number : 1258)

The contents of SSR BDS Orbit Correction Messages are shown in Table 5.1-5.

Table 5.1-5 SSR BDS Orbit Correction Messages (Message Type Number: 1258)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value : 1258)	DF002
2	BDS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	BDS reference time (Full seconds since the beginning of the BDS week)	DF465※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	Satellite Reference Datum	bit (1)	1	0 or 1	Orbit corrections refer to Satellite Reference Datum: (0:ITRF, 1:Regional)	DF375
6	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
7	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
8	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
9	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #9)		68			
#10 ~ #18 are repeated for each satellites (1 ~ NS (No. of Satellites))						
10	BDS Satellite ID	uint 6	6	0 ~ 63	BDS Satellite ID	DF466※1
11	BDS t_{oe} Modulo	bit (10)	10	0 ~ 8184	BDS ephemeris reference time t_{oe} modulo-8192	DF470※1
12	BDS IOD CRC	bit (24)	24	0 ~ 1073741823	Issue of Data for BDS derived from CRC over broadcasted ephemeris and clock parameters.	DF471※1
13	Delta Radial	int 22	22	±209.7151[m]	Radial orbit correction for broadcast ephemeris.	Resolution: 0.1[mm] DF365

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14	Delta Along Track	int 20	20	±209.7148[m]	Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF366
15	Delta Cross-Track	int 20	20	±209.7148[m]	Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.4[mm] DF367
16	Dot Delta Radial	int 21	21	±1.048575[m/s]	Velocity of Radial orbit correction for broadcast ephemeris.	Resolution: 0.001[mm/s] DF368
17	Dot Delta Along- Track	int 19	19	±1.048572[m/s]	Velocity of Along-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF369
18	Dot Delta Cross- Track	int 19	19	±1.048572[m/s]	Velocity of Cross-Track orbit correction for broadcast ephemeris.	Resolution: 0.004[mm/s] DF370
	Subtotal (#10~#18)		161			
	Total		68 + 161×NS			

※1 Defined in draft version of RTCM (Refer to Applicable Document(3)).

5.2 SSR Code Bias Messages

The contents of SSR Code Bias Messages for GPS, GLONASS, QZSS, GALILEO and BDS are shown from Table 5.2-1 to Table 5.2-5. The content and format of them follows RTCM SSR format (Reference: Applicable Documents(2), (3)). A symbol beginning with "DF" in the column "Remarks" indicates “Data Field” defined in RTCM format. The update interval data field of code bias message is fixed at the maximum value because it is longer than the range that can be represented by the RTCM SSR format. B

(1) GPS (Message Type Number : 1059)

The contents of SSR GPS Cpde Bias Messages are shown in Table 5.2-1.

Table 5.2-1 SSR GPS Code Bias Messages (Message Type Number: 1059)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 – 4095	SSR Message Type Number (Value:1059)	DF002
2	GPS Epoch Time 1s	uint 20	20	0 – 604799[s]	GPS reference time (Full seconds since the beginning of the GPS week)	DF385
3	SSR Update Interval	bit (4)	4	0 – 15	The SSR Update Intervals for this message.(Value:15)	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 – 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 – 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 – 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 – 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 ~ #12 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GPS Satellite ID	uint 6	6	1 – 32	GPS Satellite ID	DF068
10	No. of Code Biases Processed	uint 5	5	0 – 31	Number of Code Biases for one individual satellite	DF379
	Subtotal (#9 + #10)		11			
	#11 and #12 are repeated for NCB (No. of Code Biases Processed: see #10) times					

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11	GPS Signal and Tracking Mode Indicator	uint 5	5	0 – 31	No. of Code Bias Indicator to specify the GPS signal and tracking mode	DF380
12	Code Bias	int 14	14	±81.91[m]	Code Bias for specified Signal	Resolution: 0.01[m] DF383
	Subtotal(#11+#12)		19			
	Total	67＋11×NS ＋19× Σ NCB				

(2) QZSS (Message Type Number: 1248)
The contents of SSR QZSS Code Bias Messages are shown in Table 5.2-2.

Table5.2-2 SSR QZSS Code Bias Correction Messages (Message Type Number: 1248)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 – 4095	SSR Message Type Number (Value:1248)	DF002
2	QZSS Epoch Time 1s	uint 20	20	0 – 604799[s]	QZSS Reference time (Full seconds since the beginning of the GPS week)	DF460※1
3	SSR Update Interval	bit (4)	4	0 – 15	The SSR Update Intervals for this message.(Value:15)	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 – 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 – 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 – 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 4	4	0 – 15	Number of Satellites included in the message	Original DF
	Subtotal (#1 ~ #8)		65			
#9 ~ #12 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	QZSS Satellite ID	uint 4	4	1 – 10	QZSS Satellite ID※2	DF429
10	No. of Code Biases Processed	uint 5	5	0 – 31	Number of Code Biases for one individual satellite	DF379
	Subtotal (#9 + #10)		9			
	#11 and #12 are repeated for NCB (No. of Code Biases Processed: see #10) times					
11	QZSS Signal and Tracking Mode Indicator	uint 5	5	0 – 31	No. of Code Bias Indicator to specify the QZSS signal and tracking mode※3	DF461※1
12	Code Bias	int 14	14	±81.91[m]	Code Bias for specified Signal	Resolution: 0.01[m] DF383
	Subtotal(#11+#12)		19			
	Total	65＋9×NS ＋19× Σ NCB				

※1 Defined in draft version of RTCM (Refer to Applicable Document(3)).

※2 Defined in Table 5.1-2 Note2.

※3 Indicator to specify the QZSS signal and tracking is defined as below;

Indicator to specify the QZSS signal and tracking

ID	QZSS Signal and Tracking
0	L1 C/A
1	L1 L1C (D)
2	L1 L1C (P)
3	L2 L2C (M)
4	L2 L2C (L)
5	L2 L2C (M+L)
6	L5 I
7	L5 Q
8	L5 I+Q
9～	Reserved

(3) GALILEO (Message Type Number : 1242)
The contents of SSR GALILEO Code Bias Messages are shown in Table 5.2-3.

Table 5.2-3 SSR GALILEO Code Bias Messages (Message Type Number: 1242)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 – 4095	SSR Message Type Number (Value:1242)	DF002
2	GALILEO Epoch Time 1s	uint 20	20	0 – 604799[s]	GALILEO Reference time (Full seconds since the beginning of the GALILEO week)	DF458※1
3	SSR Update Interval	bit (4)	4	0 – 15	The SSR Update Intervals for this message.(value:15)	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 – 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 – 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 – 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 – 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 ~ #12 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GALILEO Satellite ID	uint 6	6	0 – 63	GALILEO Satellite ID	DF252
10	No. of Code Biases Processed	uint 5	5	0 – 31	Number of Code Biases for one individual satellite	DF379
	Subtotal (#9 + #10)		9			
	#11 and #12 are repeated for NCB (No. of Code Biases Processed: see #10) times					
11	GALILEO Signal and Tracking Mode Indicator	uint 5	5	0 – 31	No. of Code Bias Indicator to specify the Galileo signal and tracking mode	DF382
12	Code Bias	int 14	14	±81.91[m]	Code Bias for specified Signal	Resolution: 0.01[m] DF383
	Subtotal(#11+#12)		19			
	Total	67＋11×NS ＋19×ΣNCB				

※1 Defined in draft version of RTCM (Refer to Applicable Document(3)).

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(4) GLONASS (Message Type Number : 1065)

The contents of SSR GLONASS Code Bias Messages are shown in Table 5.2-4.

Table 5.2-4 SSR GLONASS Code Bias Messages (Message Type Number: 1065)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1065)	DF002
2	GLONASS Epoch Time 1s	uint 17	17	0 ~ 86399 [s]	GLONASS reference time (Full seconds since the beginning of the GLONASS day)	DF386
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.(Value:15)	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		64			
#9 ~ #12 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GLONASS Satellite ID	uint 5	5	1 ~ 24	GLONASS Satellite ID	DF384
10	No. of Code Biases Processed	uint 5	5	0 ~ 31	Number of Code Biases for one individual satellite	DF379
	Subtotal (#9 + #10)		10			
	#11 and #12 are repeated for NCB (No. of Code Biases Processed: see #10) times					
11	GLONASS Signal and Tracking Mode Indicator	uint 5	5	0 ~ 31	No. of Code Bias Indicator to specify the GLONASS signal and tracking mode	DF380
12	Code Bias	int 14	14	±81.91 [m]	Code Bias for specified Signal	Resolution: 0.01[m] DF383
	Subtotal(#11+#12)		19			
	Total	64 + 10×NS + 19×ΣNCB				

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(5) BDS (Message Type Number : 1260)

The contents of SSR BDS Code Bias Messages are shown in Table 5.2-5.

Table 5.2-5 SSR BDS Code Bias Messages (Message Type Number: 1260)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value : 1260)	DF002
2	BDS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	BDS reference time (Full seconds since the beginning of the BDS week)	DF465※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.(Value:15)	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 ~ #12 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	BDS Satellite ID	uint 6	6	0-63	BDS Satellite ID	DF466※1
10	No. of Code Biases Processed	uint 5	5	0 ~ 31	Number of Code Biases for one individual satellite	DF379※1
	Subtotal (#9 + #10)		11			
	#11 and #12 are repeated for NCB (No. of Code Biases Processed: see #10) times					
11	BDS Signal and Tracking Mode Indicator	uint 5	5	0 ~ 31	No. of Code Bias Indicator to specify the BDS signal and tracking mode	DF467※1
12	Code Bias	int 14	14	±81.91 [m]	Code Bias for specified Signal	Resolution: 0.01[m] DF383
	Subtotal(#11+#12)		19			
		67 + 11×NS + 19×∑NCB				

※1 Defined in draft version of RTCM (Refer to Applicable Document(3)).

B

5.3 SSR URA quality Messages

The contents of SSR URA quality Messages for GPS, GLONASS, QZSS, GALILEO and BDS are shown from Table 5.3-1 to Tble 5.3-5. The content and format of them follows RTCM format (Reference: Applicable Documents(2),(3)). A symbol beginning with "DF" in the column "Remarks" indicates “Data Field” defined in RTCM format. The update interval of the correction massage is published on the website. B

(1) GPS (Message Type Number : 1061)

The contents of SSR GPS URA Messages are shown in Table 5.3-1.

Table 5.3-1 SSR GPS URA Messages (Message Type Number: 1061)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint12	12	0 ~ 4095	SSR Message Type Number (Value:1061)	DF002
2	GPS Epoch Time 1s	uint20	20	0 ~ 604799[s]	GPS reference time (Full seconds since the beginning of the GPS week)	DF385
3	SSR Update Interval	bit(4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit(1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GPS Satellite ID	uint 6	6	1 ~ 32	GPS Satellite ID	DF068
10	SSR URA	bit(6)	6	bits 3~5: 0~7 bits 0~2: 0~7	SSR User Range Accuracy (URA) (1 sigma) represented by a combination of URA_CLASS (high 3 bits) and URA_VALUE (low 3 bits).	DF389
	Subtotal (#9+#10)		12			
	Total	67 + 12×NS				

(2) QZSS (Message Type Number: 1250)

The contents of SSR QZSS URA quality information Messages are shown in Table 5.3-2.

Table5.3-2 SSR QZSS URA Messages (Message Type Number: 1250)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1250)	DF002
2	QZSS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	QZSS Reference time (Full seconds since the beginning of the GPS week)	DF460※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 4	4	0 ~ 15	Number of Satellites included in the message	Original DF
	Subtotal (#1 ~ #8)		65			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	QZSS Satellite ID	uint 4	4	1 ~ 10	QZSS Satellite ID ※2	DF429
10	SSR URA	bit (6)	6	bits 3~5: 0~7 bits 0~2: 0~7	SSR User Range Accuracy (URA) (1 sigma) represented by a combination of URA_CLASS (high 3 bits) and URA_VALUE (low 3 bits).	DF389
	Subtotal (#9+#10)		10			
	Total	65 + 10×NS				

※1 Defined draft version of RTCM (refer to Applicable Document(3)).

※2 Defined in Table 5.1-2 Note 2.

(3) GALILEO (Message Type Number : 1244)

The contents of SSR GPS URA Messages are shown in Table 5.3-3.

Table 5.3-3 SSR GALILEO URA Messages (Message Type Number: 1244)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1244)	DF002
2	GALILEO Epoch Time 1s	uint 20	20	0 ~ 604799[s]	GALILEO Reference time (Full seconds since the beginning of the GALILEO week)	DF458※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GALILEO Satellite ID	uint 6	6	0 ~ 63	GALILEO Satellite ID	DF252
10	SSR URA	bit (6)	6	bits 3~5: 0~7 bits 0~2: 0~7	SSR User Range Accuracy (URA) (1 sigma) represented by a combination of URA_CLASS (high 3 bits) and URA_VALUE (low 3 bits).	DF389
	Subtotal (#9+#10)		12			
	Total		67 + 12×NS			

※1 Defined draft version of RTCM (refer to Applicable Document(3)).

B

(4) GLONASS (Message Type Number : 1067)

The contents of SSR GLONASS URA Messages are shown in Table 5.3-4.

Table 5.3-4 SSR GLONASS URA Messages (Message Type Number: 1067)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1067)	DF002
2	GLONASS Epoch Time 1s	uint 17	17	0 ~ 86399 [s]	GLONASS reference time (Full seconds since the beginning of the GLONASS day)	DF386
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		64			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8)						
9	GLONASS Satellite ID	uint 5	5	1 ~ 24	GLONASS Satellite ID	DF384
10	SSR URA	bit (6)	6	bits 3~5: 0~7 bits 0~2: 0~7	SSR User Range Accuracy (URA) (1 sigma) represented by a combination of URA_CLASS (high 3 bits) and URA_VALUE (low 3 bits).	DF389
	Subtotal (#9+#10)		11			
	Total	64 + 11×NS				

B

(5) BDS (Message Type Number : 1062)

The contents of SSR BDS URA Messages are shown in Table 5.3-5.

Table 5.3-5 SSR BDS URA Messages (Message Type Number: 1062)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value : 1262)	DF002
2	BDS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	BDS reference time (Full seconds since the beginning of the BDS week)	DF465※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	BDS Satellite ID	uint 6	6	0 ~ 63	BDS Satellite ID	DF466※1
10	SSR URA	bit (6)	6	bits 3~5: 0~7 bits 0~2: 0~7	SSR User Range Accuracy (URA) (1 sigma) represented by a combination of URA_CLASS (high 3 bits) and URA_VALUE (low 3 bits).	DF389
	Subtotal (#9+#10)		12			
	Total		67 + 12×NS			

※1 Defined draft version of RTCM (refer to Applicable Document(3)).

B

5.4 SSR High Rate Clock Correction Messages

The contents of SSR High Rate Clock Correction Messages for GPS, GLONASS, QZSS, GALILEO and BDS are shown from Table 5.4-1 to Tble 5.4-5. The content and format of them are based on RTCM format (Reference: Applicable Documents(2),(3)) and please refer to section 4.2.4 in this document about their difference. A symbol beginning with "DF" in the column "Remarks" indicates “Data Field” defined in RTCM format. The update interval of the correction massage is published on the website. B

(1) GPS (Message Type Number: 1062)

The contents of SSR GPS High Rate Clock Correction Messages are shown in Table 5.4-1.

Table5.4-1 SSR GPS High Rate Clock Correction Messages (Message Type Number: 1062)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1057)	DF002
2	GPS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	GPS reference time (Full seconds since the beginning of the GPS week)	DF385
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391 B
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)	67				
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GPS Satellite ID	uint 6	6	1 ~ 32	GPS Satellite ID	DF068
10	High Rate Clock Correction	int 22	22	±209.7151 [m]	High Rate Clock correction Value	DF390
	Subtotal (#9+#10)	28				
	Total	67 + 28×NS				

(2) QZSS (Message Type Number: 1251)

The contents of SSR QZSS High Rate Clock Correction Messages are shown in Table 5.4-2.

Table5.4-2 SSR QZSS High Rate Clock Correction Messages (Message Type Number: 1251)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1251)	DF002
2	QZSS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	QZSS Reference time (Full seconds since the beginning of the GPS week)	DF460※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 4	4	0 ~ 15	Number of Satellites included in the message	Original DF
	Subtotal (#1 ~ #8)		65			
#9 and #10 are repeated for each satellites (1 –NS (No. of Satellites: see #8))						
9	QZSS Satellite ID	uint 4	4	1 ~ 10	QZSS Satellite ID (※2)	DF429
10	High Rate Clock Correction	int 22	22	±209.7151 [m]	High Rate Clock correction Value	DF390
	Subtotal (#9+#10)		26			
	Total	65 + 26×NS				

B

※1 Defined draft version of RTCM (refer to Applicable Document(3)).

※2 Defined in Table 5.1-2 Note2.

(3) GALILEO (Message Type Number: 1245)

The contents of SSR GALILEO High Rate Clock Correction Messages are shown in Table 5.4-3.

Table5.4-3 SSR GALILEO High Rate Clock Correction Messages (Message Type Number: 1245)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1245)	DF002
2	GALILEO Epoch Time 1s	uint 20	20	0 ~ 604799[s]	GALILEO Reference time (Full seconds since the beginning of the GALILEO week)	DF458※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GALILEO Satellite ID	uint 6	6	0 ~ 63	GALILEO Satellite ID	DF252
10	High Rate Clock Correction	int 22	22	±209.7151 [m]	High Rate Clock correction Value	DF390
	Subtotal (#9+#10)		28			
	Total	67 + 28×NS				

※1 Defined draft version of RTCM (refer to Applicable Document(3)).

B

(4) GLONASS (Message Type Number: 1068)

The contents of SSR GLONASS High Rate Clock Correction Messages are shown in Table 5.4-4.

Table 5.4 4 SSR GLONASS High Rate Clock Correction Messages (Message Type Number: 1068)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1068)	DF002
2	GLONASS Epoch Time 1s	uint 17	17	0 ~ 86399 [s]	GLONASS reference time (Full seconds since the beginning of the GLONASS day)	DF386
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	GLONASS Satellite ID	uint 5	5	1 ~ 24	GLONASS Satellite ID	DF384
10	High Rate Clock Correction	int 22	22	±209.7151 [m]	High Rate Clock correction Value	DF390
	Subtotal (#9+#10)		28			
	Total	67 + 28×NS				

B

(5) BDS (Message Type Number: 1263)

The contents of SSR BDS High Rate Clock Correction Messages are shown in Table 5.4-5.

Table 5.4 5 SSR BDS High Rate Clock Correction Messages (Message Type Number: 1263)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value:1263)	DF002
2	BDS Epoch Time 1s	uint 20	20	0 ~ 604799 [s]	BDS reference time (Full seconds since the beginning of the BDS week)	DF465※1
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15	Issue Of Data number for SSR in this message.	DF413
6	SSR Provider ID	uint 16	16	0 ~ 65535	SSR Provider ID number	DF414
7	SSR Solution ID	uint 4	4	0 ~ 15	SSR Solution ID number	DF415
8	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		67			
#9 and #10 are repeated for each satellites (1 ~ NS (No. of Satellites: see #8))						
9	BDS Satellite ID	uint 6	6	0 ~ 63	BDS Satellite ID	DF466※1
10	High Rate Clock Correction	int 22	22	±209.7151 [m]	High Rate Clock correction Value	DF390
	Subtotal (#9+#10)		28			
	Total	67 + 28×NS				

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※1 Defined draft version of RTCM (refer to Applicable Document(3)).

5.5 Carrier Phase Bias

The contents of SSR Carrier Phase Bias Correction Messages for GPS, GLONASS, QZSS, GALILEO and BDS are shown in Table 5.5-1 to Table 5.5-5. In MADOCA-SEAD, carrier phase biases are provided per each frequency of individual satellite and used for PPP-AR with the method of FCB (Fractional Cycle Bias)(Reference: Reference Document(1)).

A notation that starts with "DF" in the column "Remarks" indicates the corresponding Data Field in the documentation of RTCM version 10403.2 (Reference: Applicable Documents (2),(3),(4)) excluding the column Standard deviation for carrier phase biases. The unused data fields, which are described as “Not defined in MADOCA” in the remarks column, are set to zero. The update interval of the correction massage is published on the website.

B

(1) GPS (Message Type Number: 11※1)

The contents of SSR GPS Carrier Phase Bias Correction Messages are shown in Table5.5-1.

Table5.5-1 SSR GPS Carrier Phase Bias Correction Messages (Message Type Number: 11※1)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value: 11※1)	DF002
2	GPS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	GPS reference time (Full seconds since the beginning of the GPS week)	DF385
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1 (fix to 0)	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15 (fix to 0)	Issue Of Data number for SSR in this message.	DF413 Not defined in MADOCA
6	SSR Provider ID	uint 16	16	0 ~ 65535 (fix to 0)		DF414 Not defined in MADOCA
7	SSR Solution ID	uint 4	4	0 ~ 15 (fix to 0)		DF415 Not defined in MADOCA
8	Dispersive Bias Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF486※2 Not defined in MADOCA
9	MW Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF487※2 Not defined in MADOCA

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10	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		69			
#11 ~ #20 are repeated for each satellites (1 ~ NS (No. of Satellites: see #10))						
11	GPS Satellite ID	uint6	6	1 ~ 32	GPS Satellite ID	DF068
12	No of Phase Biases Processed	uint5	5	0 ~ 31	No of Phase Biases Processed for one individual satellite	DF479※2
13	Yaw Angle	uint9	9	0 ~ (2 – 1/256) [semi-circles] (fix to 0)	Yaw Angle	DF480※2
14	Yaw Rate	int8	8	±(127/8192) [semi-circles / second] (approx. ±2.79 [degree/second]) (fix to 0)	Yaw Rate	DF481※2
	Subtotal (#11~ #14)		28			
	#15 ~ #20 are repeated for NPB (No. of Phase Biases Processed: see #12) times					
15	GPS Signal and Tracking Mode Indicator	uint 5	5	0 ~ 31	GPS Signal and Tracking Mode Indicator	DF382
16	Signal Integer Indicator	uint 1	1	0 or 1 (fix to 0)		DF483※2 Not defined in MADOCA
17	Signals Wide-Lane Integer Indicator	bit (2)	2	00, 01, 10, 11 (fix to 00)		DF484※2 Not defined in MADOCA
18	Signal Discontinuity Counter	uint 4	4	0 ~ 15 (fix to 0)		DF485※2 Not defined in MADOCA
19	Phase Bias (FCB)	int 20	20	±52.4287 [m]	Phase Bias (FCB)	Resolution: 0.0001[m] DF482(※2)
20	Standard deviation of Phase Bias (FCB)	uint 17	17	0 ~ 13.1071 [m]	Standard deviation of Phase Bias (FCB)	Resolution: 0.0001[m] Orignal DF
	Subtotal (#15 ~ #20)		49			
	Total	69 + 28×NS + 49×ΣNPB				

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※1 As of September 2016, JAXA has been using "2065" as Message Type Number for Carrier Phase Bias of GPS, However, this message type is changed to “11” in Feburuary 2017 (Reference: Table 4.1-1 Note 5).

※2 Defined in draft version of RTCM (ref er to Applicable Document(3)).

※3 Defined draft version of RTCM (refer to Applicable Document(4)).

(2) QZSS (Message Type Number: 13※1)

The contents of SSR QZSS Carrier Phase Bias Correction Messages are shown in Table5.5-2.

Table5.5-2 SSR QZSS Carrier Phase Bias Correction Messages (Message Type Number: 13※1)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks	
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value: 13※1)	DF002	
2	QZSS Epoch Time 1s	uint 20	20	0 ~ 604799[s]	QZSS Reference time (Full seconds since the beginning of the GPS week)	DF460※2	
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391	B
4	Multiple Message Indicator	bit (1)	1	0 or 1 (fix to 0)	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388	
5	IOD SSR	uint 4	4	0 ~ 15 (fix to 0)	Issue Of Data number for SSR in this message.	DF413 Not defined in MADOCA	
6	SSR Provider ID	uint 16	16	0 ~ 65535 (fix to 0)		DF414 Not defined in MADOCA	
7	SSR Solution ID	uint 4	4	0 ~ 15 (fix to 0)		DF415 Not defined in MADOCA	
8	Dispersive Bias Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF486※3 Not defined in MADOCA	
9	MW Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF487※3 Not defined in MADOCA	
10	No. of Satellites	uint 4	4	0 ~ 15	Number of Satellites included in the message	Original DF	
	Subtotal (#1 ~ #8)		67				
#11 ~ #20 are repeated for each satellites (1 ~ NS (No. of Satellites: see #10))							
11	QZSS Satellite ID	uint4	4	1 ~ 10	QZSS Satellite ID	DF429※2	
12	No of Phase Biases Processed	uint5	5	0 ~ 31	No of Phase Biases Processed for one individual satellite	DF479※3	
13	Yaw Angle	uint9	9	0 ~ (2 – 1/256) [semi-circles] (fix to 0)	Yaw Angle	DF480※3	B

14	Yaw Rate	int8	8	±(127/8192) [semi-circles / second] (approx. ±2.79 [degree/second]) (fix to 0)	Yaw Rate	DF481※3	B
	Subtotal (#11 ~ #14)		26				
	#15 ~ #20 are repeated for NCB (No. of Carrier Phase Biases Processed: see #12) times						
15	QZSS Signal and Tracking Mode Indicator	uint 5	5	0 ~ 31	QZSS Signal and Tracking Mode Indicator	DF461※3	
16	Signal Integer Indicator	uint 1	1	0 or 1 (fix to 0)		DF483※4 Not defined in MADOCA	B
17	Signals Wide-Lane Integer Indicator	bit (2)	2	00, 01, 10, 11 (fix to 00)		DF484※4 Not defined in MADOCA	
18	Signal Discontinuity Counter	uint 4	4	0 ~ 15 (fix to 0)		DF485※4 Not defined in MADOCA	
19	Phase Bias (FCB)	int 20	20	±52.4287 [m]	Phase Bias (FCB)	Resolution: 0.0001[m] DF482(※4)	
20	Standard deviation of Phase Bias (FCB)	uint 17	17	0 ~ 13.1071 [m]	Standard deviation of Phase Bias (FCB)	Resolution: 0.0001[m] Original DF	
	Subtotal (#15 ~ #20)		49				
	Total	67 + 26×NS + 49×ΣNPB					

※1 As of September 2016, JAXA has been using "2068" as Message Type Number for Carrier Phase Bias of QZSS, However, this message type is changed to “13” in Feburuary 2017(Reference: Table 4.1-1 Note 5).

※2 Defined in draft version of RTCM (refer to Applicable Document(3)).

※3 Defined in draft version of RTCM (refer to Applicable Document(4)).

(3)GALILEO (Message Type Number: 12※1)

The contents of SSR GALILEO Carrier Phase Bias Correction Messages are shown in Table5.5-3.

Table5.5-3 SSR GALILEO Carrier Phase Bias Correction Messages (Message Type Number:12※1)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks
1	Message Number	uint 12	12	0 ~ 4095	SSR Message Type Number (Value: 12※1)	DF002
2	GALILEO Epoch Time 1s	uint 20	20	0 ~ 604799[s]	GALILEO Reference time (Full seconds since the beginning of the GPS week)	DF458※2
3	SSR Update Interval	bit (4)	4	0 ~ 15	The SSR Update Intervals for this message.	DF391
4	Multiple Message Indicator	bit (1)	1	0 or 1 (fix to 0)	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388
5	IOD SSR	uint 4	4	0 ~ 15 (fix to 0)	Issue Of Data number for SSR in this message.	DF413 Not defined in MADOCA
6	SSR Provider ID	uint 16	16	0 ~ 65535 (fix to 0)		DF414 Not defined in MADOCA
7	SSR Solution ID	uint 4	4	0 ~ 15 (fix to 0)		DF415 Not defined in MADOCA
8	Dispersive Bias Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF486※3 Not defined in MADOCA
9	MW Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF487※3 Not defined in MADOCA
10	No. of Satellites	uint 6	6	0 ~ 63	Number of Satellites included in the message	DF387
	Subtotal (#1 ~ #8)		69			
#11 ~ #20 are repeated for each satellites (1 ~ NS (No. of Satellites: see #10))						
11	GALILEO Satellite ID	uint6	6	1 ~ 32	GALILEO Satellite ID	DF252
12	No of Phase Biases Processed	uint5	5	0 ~ 31	No of Phase Biases Processed for one individual satellite	DF479※3

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13	Yaw Angle	uint9	9	0 ~ (2 – 1/256) [semi-circles] (fix to 0)	Yaw Angle	DF480※3	B
14	Yaw Rate	int8	8	±(127/8192) [semi-circles / second] (approx. ±2.79 [degree/second]) (fix to 0)	Yaw Rate	DF481※3	
	Subtotal (#11 ~ #14)		28				
	#15 ~ #20 are repeated for NCB (No. of Carrier Phase Biases Processed: see #12) times						
15	GALILEO Signal and Tracking Mode Indicator	uint 5	5	0 ~ 31	GALILEO Signal and Tracking Mode Indicator	DF382	
16	Signal Integer Indicator	uint 1	1	0 or 1 (fix to 0)		DF483※3 Not defined in MADOCA	B
17	Signals Wide-Lane Integer Indicator	bit (2)	2	00, 01, 10, 11 (fix to 00)		DF484※3 Not defined in MADOCA	
18	Signal Discontinuity Counter	uint 4	4	0 ~ 15 (fix to 0)		DF485※3 Not defined in MADOCA	
19	Phase Bias (FCB)	int 20	20	±52.4287 [m]	Phase Bias (FCB)	Resolution 0.0001[m] DF482※3	
20	Standard deviation of Phase Bias (FCB)	uint17	17	0 ~ 13.1071 [m]	Standard deviation of Phase Bias (FCB)	Resolution: 0.0001[m] Original DF	
	Subtotal (#15 ~ #20)		49				
	Total	69 + 28×NS + 49×ΣNPB					

※1 As of September 2016, JAXA has been using "2067" as Message Type Number for Carrier Phase Bias of GALILEO, However, this message type is changed to “12” in Feburuary 2017(Reference: Table 4.1-1 Note 5).

※2 Defined draft version of RTCM (refer to Applicable Document(3)).

※3 Defined draft version of RTCM (refer to Applicable Document(4)).

(4) BDS (Message Type Number: 14※1)

The contents of SSR BDS Carrier Phase Bias Correction Messages are shown in Table5.5-4.

Table5.5-4 SSR BDS Carrier Phase Bias Correction Messages (Message Type Number: 14※1)

#	Name	Data Type	No. of Bits	Possible range	Contents	Remarks	
1	Message Number	uint 12	12	0 – 4095	SSR Message Type Number (Value: 14※1)	DF002	
2	BDS Epoch Time 1s	uint 20	20	0 – 604799[s]	BDS Reference time (Full seconds since the beginning of the GPS week)	DF465※2	
3	SSR Update Interval	bit (4)	4	0 – 15	The SSR Update Intervals for this message.	DF391	B
4	Multiple MessageIndicator	bit (1)	1	0 or 1 (fix to 0)	Indicator for transmitting messages with the same Message Number and Epoch Time (1: multiple message transmitted)	DF388	
5	IOD SSR	uint 4	4	0 – 15 (fix to 0)	Issue Of Data number for SSR in this message.	DF413 Not defined in MADOCA	
6	SSR Provider ID	uint 16	16	0 – 65535 (fix to 0)		DF414 Not defined in MADOCA	
7	SSR Solution ID	uint 4	4	0 – 15 (fix to 0)		DF415 Not defined in MADOCA	
8	Dispersive Bias Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF486※3 Not defined in MADOCA	
9	MW Consistency Indicator	bit (1)	1	0 or 1 (fix to 0)		DF487※3 Not defined in MADOCA	
10	No. of Satellites	uint 6	6	0 – 63	Number of Satellites included in the message	DF387	
	Subtotal (#1 ~ #8)		69				
#11 ~ #20 are repeated for each satellites (1 ~ NS (No. of Satellites: see #10)							
11	BDS Satellite ID	uint 6	6	0 – 63	BDS Satellite ID	DF466※2	
12	No of Phase Biases Processed	uint 5	5	0 – 31	No of Phase Biases Processed for one individual satellite	DF479※3	
13	Yaw Angle	uint 9	9	0 – (2 –1/256) [semi-circles] (fix to 0)	Yaw Angle	DF480※3	B

14	Yaw Rate	int 8	8	±(127/8192) [semi-circles / second] (approx. ±2.79 [degree/second]) (fix to 0)	Yaw Rate	DF481※3	B
	Subtotal (#11 ~ #14)		28				
	#15 ~ #20 are repeated for NCB (No. of Carrier Phase Biases Processed: see #12) times						
15	BDS Signal and Tracking Mode Indicator	uint 5	5	0 – 31	BDS Signal and Tracking Mode Indicator	DF467※2	
16	Signal Integer Indicator	uint 1	1	0 or 1 (fix to 0)		DF483※3 Not defined in MADOCA	B
17	Signals Wide-Lane Integer Indicator	bit (2)	2	00, 01, 10, 11 (fix to 0)		DF484※3 Not defined in MADOCA	
18	Signal Discontinuity Counter	uint 4	4	0 – 15 (fix to 0)		DF485※3 Not defined in MADOCA	
19	Phase Bias(FCB)	int 20	20	±52.4287 [m]	Phase Bias (FCB)	Resolution: 0.0001[m] DF482※3	
20	Standard deviation of Phase Bias (FCB)	uint 17	17	0 – 13.1071 [m]	Standard deviation of Phase Bias (FCB)	Resolution: 0.0001[m] Original DF	
	Subtotal (#15 ~ #20)		49				
	Total	69 + 28×NS + 49×Σ NPB					

※1 As of September 2016, JAXA has been using "2070" as Message Type Number for Carrier Phase Bias of BDS, however, this message type is changed to “14” in Feburuary 2017(Reference: Table 4.1-1 Note 5).

※2 Defined draft version of RTCM (refer to Applicable Document(3)).

※3 Defined draft version of RTCM (refer to Applicable Document(4)).