User's Manual

Bluetooth® Low Energy Protocol Stack

API Reference Manual: TIP

Renesas MCU

Target Device

RL78/G1D

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General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of an MPU or MCU in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

How to Use This Manual

1. Purpose and Target Readers

This manual describes the API (Application Program Interface) of the Time profile (TIP) of the Bluetooth Low Energy protocol stack (BLE software), which is used to develop Bluetooth applications that incorporate the Renesas Bluetooth low energy microcontroller RL78/G1D. It is intended for users designing application systems incorporating this software. A basic knowledge of microcontrollers and Bluetooth low energy is necessary in order to use this manual.

Related documents

The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document No.
Bluetooth Low Energy Protocol Stack	
User's Manual	R01UW0095E
API Reference Manual: Basics	R01UW0088E
API Reference Manual: FMP	R01UW0089E
API Reference Manual: PXP	R01UW0090E
API Reference Manual: HTP	R01UW0091E
API Reference Manual: BLP	R01UW0092E
API Reference Manual: HOGP	R01UW0093E
API Reference Manual: ScPP	R01UW0094E
API Reference Manual: HRP	R01UW0097E
API Reference Manual: CSCP	R01UW0098E
API Reference Manual: CPP	R01UW0099E
API Reference Manual: GLP	R01UW0103E
API Reference Manual: TIP	This manual
API Reference Manual: RSCP	R01UW0107E
API Reference Manual: ANP	R01UW0108E
API Reference Manual: PASP	R01UW0109E
API Reference Manual: LNP	R01UW0113E
Application Note: Sample Program	R01AN1375E
Application Note: rBLE Command Specification	R01AN1376E

List of Abbreviations and Acronyms

Abbreviation	Full Form	Remark
ANP	Alert Notification Profile	
ANS	Alert Notification Service	
API	Application Programming Interface	
ATT	Attribute Protocol	
BAS	Battery Service	
BB	Base Band	
BD_ADDR	Bluetooth Device Address	
BLE	Bluetooth low energy	
BLP	Blood Pressure Profile	
BLS	Blood Pressure Service	
CPP	Cycling Power Profile	
CPS	Cycling Power Service	
CSCP	Cycling Speed and Cadence Profile	
CSCS	Cycling Speed and Cadence Service	
CSRK	Connection Signature Resolving Key	
CTS	Current Time Service	
DIS	Device Information Service	
EDIV	Encrypted Diversifier	
FMP	Find Me Profile	
GAP	Generic Access Profile	
GATT	Generic Attribute Profile	
GLP	Glucose Profile	
GLS	Glucose Service	
HCI	Host Controller Interface	
HID	Human Interface Device	
HIDS	HID Service	
HOGP	HID over GATT Profile	
HRP	Heart Rate Profile	
HRS	Heart Rate Service	
HTP	Health Thermometer Profile	
HTS	Health Thermometer Service	
IAS	Immediate Alert Service	
IRK	Identity Resolving Key	
L2CAP	Logical Link Control and Adaptation Protocol	
LE	Low Energy	

Abbreviation	Full Form	Remark
LL	Link Layer	
LLS	Link Loss Service	
LNP	Location and Navigation Profile	
LNS	Location and Navigation Service	
LTK	Long Term Key	
MCU	Micro Controller Unit	
MITM	Man-in-the-middle	
MTU	Maximum Transmission Unit	
NDCS	Next DST Change Service	
OOB	Out of Band	
OS	Operating System	
PASP	Phone Alert Status Profile	
PASS	Phone Alert Status Service	
PXP	Proximity Profile	
RF	Radio Frequency	
RSCP	Running Speed and Cadence Profile	
RSCS	Running Speed and Cadence Service	
RSSI	Received Signal Strength Indication	
RTUS	Reference Time Update Service	
ScPP	Scan Parameters Profile	
ScPS	Scan Parameters Service	
SM	Security Manager	
SMP	Security Manager Protocol	
STK	Short Term Key	
TIP	Time Profile	
TK	Temporary Key	
TPS	Tx Power Service	
UART	Universal Asynchronous Receiver Transmitter	
UUID	Universal Unique Identifier	

Abbreviation	Full Form	Remark
APP	Application	
CSI	Clocked Serial Interface	
IIC	Inter-Integrated Circuit	
RSCIP	Renesas Serial Communication Interface Protocol	
VS	Vendor Specific	

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1. Overview

This manual describes the API (Application Program Interface) of the Time profile (TIP) of the Bluetooth Low Energy protocol stack (BLE software), which is used to develop Bluetooth applications that incorporate Renesas Bluetooth low energy microcontroller RL78/G1D.

For details about the organization and features of BLE software, see the Bluetooth Low Energy Protocol Stack User's Manual.

2. Common Definitions

This section describes the definitions common to the API of each profile.

2.1 Service Definitions

This section describes the common definitions of services used by the API of multiple profiles.

- Declaration of enumerated type for alert level

```
enum RBLE_SVC_ALT_LVL_enum {
   RBLE_SVC_ALERT_NONE = 0x00,              No alert
   RBLE_SVC_ALERT_MILD,                     Mild alert
   RBLE_SVC_ALERT_HIGH                      High alert
};
```

- Declaration of enumerated type for PnP ID characteristic vendor ID field

```
enum RBLE_SVC_PNP_VENDOR_ID_enum {
   RBLE_SVC_SIG_ASSIGNED_ID = 0x01,         Vendor ID assigned by Bluetooth SIG
   RBLE_SVC_USB_ASSIGNED_ID                 Vendor ID assigned by USB Implementer's
                                            Forum
};
```

- Declaration of enumerated type for Name Space field of Characteristic Presentation Format descriptor

```
enum RBLE_SVC_PRESEN_NAMESPASE_enum {
   RBLE_SVC_NAMESPACE_SIG = 0x01,           Defined by Bluetooth SIG
};
```

- Declaration of enumerated type for security level of Service

```
enum RBLE_SVC_SEC_LVL_enum {
   RBLE_SVC_SEC_NONE = 0x01,                No security
   RBLE_SVC_SEC_UNAUTH = 0x02,              Require unauthenticated pairing
   RBLE_SVC_SEC_AUTH = 0x04,                Require authenticated pairing
   RBLE_SVC_SEC_AUTZ = 0x08,                Require authorization
   RBLE_SVC_SEC_ENC = 0x10                  Require encryption
};
```

- Declaration of enumerated type for connection types

```
enum RBLE_PRF_CON_enum {
    RBLE_PRF_CON_DISCOVERY = 0x00,          Configuration connection performed
                                            when connecting for the first time
    RBLE_PRF_CON_NORMAL                     Normal connection performed when
                                            connecting for the second and
                                            subsequent times
};
```

- Declaration of enumerated type for client configuration characteristic value

```
enum RBLE_PRF_CLIENT_CONFIG_enum {
    RBLE_PRF_STOP_NTFIND = 0x00,                Stop notification or indication of
                                                characteristic value.
    RBLE_PRF_START_NTF,                         Start notification of
                                                characteristic value.
    RBLE_PRF_START_IND                          Start indication of
                                                characteristic value.
};
```

- Declaration of enumerated type for server configuration characteristic value

```
enum RBLE_PRF_SERVER_CONFIG_enum {
    RBLE_PRF_STOP_BRD = 0x00,                   Stop broadcast of characteristic value.
    RBLE_PRF_START_BRD                          Start broadcast of characteristic value.
};
```

2.2 Status Definitions

This section describes the status definitions used by the API of each profile.

- Declaration of enumerated type for rBLE status

```
enum RBLE_STATUS_enum {
    RBLE_OK = 0x00,                                Normal operation
    RBLE_PRF_ERR_INVALID_PARAM = 0x90,             Invalid parameter specified for
                                                   setting or acquiring a characteristic
                                                   value
    RBLE_PRF_ERR_INEXISTENT_HDL,                   Invalid handle specified for setting
                                                   or acquiring a characteristic value
    RBLE_PRF_ERR_STOP_DISC_CHAR_MISSING,           The characteristic value is missing.
    RBLE_PRF_ERR_MULTIPLE_IAS,                     Multiple IASs exist.
    RBLE_PRF_ERR_INCORRECT_PROP,                   Incorrect property
    RBLE_PRF_ERR_MULTIPLE_CHAR,                    Multiple characteristic values exist.
    RBLE_PRF_ERR_NOT_WRITABLE,                     Writing is not permitted.
    RBLE_PRF_ERR_NOT_READABLE,                     Reading is not permitted.
    RBLE_PRF_ERR_REQ_DISALLOWED,                   Requesting is not permitted.
    RBLE_PRF_ERR_NTF_DISABLED,                     Notification is disabled.
    RBLE_PRF_ERR_IND_DISABLED,                     Indication is disabled.
    RBLE_PRF_ERR_ATT_NOT_SUPPORTED,                The characteristic value is not
                                                   supported.
};
```

Note: Statuses other than the above are described in *API Reference Manual: Basics*.

3. Time Profile

This section describes the API of the Time profile. The Time profile is used to enable a data collection device to obtain data from timer server.

3.1 Definitions

This section describes the definitions used by the API of the Time profile.

- Declaration of enumerated type for TIP event types

```
enum RBLE_TIP_EVENT_TYPE_enum {
    RBLE_TIP_EVENT_SERVER_ENABLE_COMP = 0x01,    Server enable completion event
                                                 (Parameter: server_enable)
    RBLE_TIP_EVENT_SERVER_DISABLE_COMP,          Server disable completion event
                                                 (Parameter: server_disable)
    RBLE_TIP_EVENT_SERVER_ERROR_IND,             Server error indication event
                                                 (Parameter: error_ind)
    RBLE_TIP_EVENT_SERVER_SEND_CURRENT_TIME_COMP, Current Time send completion event
                                                 (Parameter: send_current_time)
    RBLE_TIP_EVENT_SERVER_SEND_WRITE_DATA_COMP,  Characteristic value set completion event
                                                 (Parameter: write_data)
    RBLE_TIP_EVENT_SERVER_CHG_TIME_UPDATE_CP_IND, Time Update control point change
                                                 indication event
                                                 (Parameter: chg_cp_ind)
    RBLE_TIP_EVENT_SERVER_CFG_NTF_IND,           Characteristic configuration change
                                                 indication event
                                                 (Parameter: cfg_ntf_ind)
    RBLE_TIP_EVENT_SERVER_COMMAND_DISALLOWED_IND,
                                                 Command disallowed indication event
                                                 (Parameter: cmd_disallowed_ind)
    RBLE_TIP_EVENT_CLIENT_ENABLE_COMP = 0x81,    Client enable completion event
                                                 (Parameter: client_enable)
    RBLE_TIP_EVENT_CLIENT_DISABLE_COMP,          Client disable completion event
                                                 (Parameter: client_disable)
    RBLE_TIP_EVENT_CLIENT_ERROR_IND,             Client error indication event
                                                 (Parameter: error_ind)
    RBLE_TIP_EVENT_CLIENT_MEASUREMENTS_NTF,      Current Time notification event
                                                 (Parameter: current_time_ntf)
    RBLE_TIP_EVENT_CLIENT_READ_CHAR_RESPONSE,    Characteristic value read request
                                                 response event
                                                 (Parameter: rd_char_resp)
    RBLE_TIP_EVENT_CLIENT_WRITE_CHAR_RESPONSE,   Characteristic value write request
                                                 response event
                                                 (Parameter: wr_char_resp)
    RBLE_TIP_EVENT_CLIENT_COMMAND_DISALLOWED_IND Command disallowed indication event
                                                 (Parameter: cmd_disallowed_ind)
};
```

- Declaration of data type for TIP event types

```
typedef uint8_t RBLE_TIP_EVENT_TYPE;
```

- Declaration of data type for TIP Server event callback function

```
typedef void ( *RBLE_TIPS_EVENT_HANDLER )( RBLE_TIPS_EVENT *event );
```

- Declaration of data type for TIP Client event callback function

```
typedef void ( *RBLE_TIPC_EVENT_HANDLER )( RBLE_TIPC_EVENT *event );
```

- Declaration of enumerated type for reading current time service/next DST change service/reference time update service characteristic codes

```
enum RBLE_TIPC_RD_CHAR_CODE_enum {
    RBLE_TIPC_RD_CTS_CRNT_TIME = 0x00,          Current time
    RBLE_TIPC_RD_CTS_CRNT_TIME_CFG,             Current time notification
    RBLE_TIPC_RD_CTS_LOCAL_TIME,                Local time information
    RBLE_TIPC_RD_CTS_REF_TIME,                  Reference time information
    RBLE_TIPC_RD_NDCS_TIME_DST,                 Time with DST
    RBLE_TIPC_RD_RTUS_UPDATE_STATUS,            Time update status
};
```

- Declaration of enumerated type for setting current time service/next DST change service/reference time update service characteristic codes

```
enum RBLE_TIPS_WR_CHAR_CODE_enum {
    RBLE_TIPS_WR_CTS_CRNT_TIME = 0x00,          Current time
    RBLE_TIPS_WR_CTS_LOCAL_TIME,                Local time information
    RBLE_TIPS_WR_CTS_REF_TIME,                  Reference time information
    RBLE_TIPS_WR_NDCS_TIME_DST,                 Time with DST
    RBLE_TIPS_WR_RTUS_UPDATE_STATUS,            Time update status
};
```

- Declaration of enumerated type for day of week

```
enum RBLE_TIP_DAY_OF_WEEK_enum {
    RBLE_TIP_TIME_WEEK_UNKNOWN = 0x00,          Day of week is not known
    RBLE_TIP_TIME_MONDAY,                 Monday
    RBLE_TIP_TIME_TUESDAY,                      Tuesday
    RBLE_TIP_TIME_WEDNESDAY,                    Wednesday
    RBLE_TIP_TIME_THURSDAY,                     Thursday
    RBLE_TIP_TIME_FRIDAY,                       Friday
    RBLE_TIP_TIME_SATURDAY,                     Saturday
    RBLE_TIP_TIME_SUNDAY                        Sunday
};
```

- Declaration of enumerated type for DST offset

```
enum RBLE_TIP_DST_OFFSET_enum {
    RBLE_TIP_DST_STANDARD = 0x00,                Standard Time
    RBLE_TIP_DST_HALF_AN_HOUR_DAYLIGHT = 0x02,   Half an hour daylight time (+0.5h)
    RBLE_TIP_DST_DAYLIGHT = 0x04,                Daylight time (+1h)
    RBLE_TIP_DST_DOUBLE_DAYLIGHT = 0x08,         Double daylight time (+2h)
    RBLE_TIP_DST_UNLNOWN = 0xff                  DST is not known
};
```

- Declaration of enumerated type for reference time source

```
enum RBLE_TIP_TIME_SOURCE_enum {
    RBLE_TIP_TIME_SOURCE_UNKNOWN = 0x00,         Unknown
    RBLE_TIP_TIME_SOURCE_NET_TINE_PRTCL,         Network time protocol
    RBLE_TIP_TIME_SOURCE_GPS,                    GPS
    RBLE_TIP_TIME_SOURCE_RADIO,                  Radio time signal
    RBLE_TIP_TIME_SOURCE_MANUAL,                 Manual
    RBLE_TIP_TIME_SOURCE_ATOMIC,                 Atomic Clock
    RBLE_TIP_TIME_SOURCE_CELLULAR_NET            Cellular Network
};
```

- Declaration of enumerated type for time update control point

```
enum RBLE_TIP_TIME_UPDATE_CP_enum {
    RBLE_TIP_CP_REF_UPDATE = 0x01,               Reference update request
    RBLE_TIP_CP_REF_UPDATE_CANCEL                Canceled Reference update request
};
```

- Declaration of enumerated type for time update status

```
enum RBLE_TIP_TIME_UPDATE_STATUS_enum {
    RBLE_TIP_TIME_UPDATE_IDLE = 0x01,            Idle
    RBLE_TIP_TIME_UPDATE_PENDING                 Update Pending
};
```

- Declaration of enumerated type for time update result

```
enum RBLE_TIP_TIME_UPDATE_RESULT_enum {
    RBLE_TIP_TIME_UPDATE_SUCCESS = 0x00,         Successful
    RBLE_TIP_TIME_UPDATE_CANCELED,               Canceled
    RBLE_TIP_TIME_UPDATE_NO_CONNECT,             No connection to reference
    RBLE_TIP_TIME_UPDATE_REF_ERROR,              Reference responded with an error
    RBLE_TIP_TIME_UPDATE_TIMEOUT,                Timeout
    RBLE_TIP_TIME_UPDATE_NOT_ATTEMPTED           Update not attempted after reset
};
```

- Date and time information structures

```
typedef struct RBLE_DATE_TIME_t{
    uint16_t      year;                          Year
    uint8_t       month;                         Month
```

```
    uint8_t       day;                              Day
    uint8_t       hour;                             Hour
    uint8_t       min;                              Minute
    uint8_t       sec;                              Second
    uint8_t       reserved;                         Reserved
}RBLE_DATE_TIME;
```

- Current time information structures

```
typedef struct RBLE_TIP_CURRENT_TIME_t {
    RBLE_DATA_TIME    stamp;                        Date and time
    uint8_t           day_of_week;                  Day of week
    uint8_t           fractions256;                 1/256th of a second [1/256s]
    uint8_t           adjust_reason;                Time adjust reason
    uint8_t           reserved;                     Reserved
} RBLE_TIP_CURRENT_TIME;
```

- Local time information structures

```
typedef struct RBLE_TIP_LOCAL_TIME_INFO_t{
    int8_t          time_zone;                      Time zone
    uint8_t         dst_offset;                     Daylight saving time
} RBLE_TIP_LOCAL_TIME_INFO;
```

- Reference time information structure

```
typedef struct RBLE_TIP_REFERENCE_TIME_INFO_t{
    uint8_t         time_source;                    Time source
    uint8_t         accuracy;                       Accuracy of time [125ms]
    uint8_t         days_since_update;              Days since update
    uint8_t         hours_since_update;             Hours since update
} RBLE_TIP_REFERENCE_TIME_INFO;
```

- Time with DST information structure

```
typedef struct RBLE_TIP_NEXT_TIME_DST_INFO_t{
    RBLE_DATA_TIME  stamp;                          DST updating time
    uint8_t         dst_offset;                     Daylight saving time
    uint8_t         reserved;                       Reserved
} RBLE_TIP_NEXT_TIME_DST_INFO;
```

- Time update state information structure

```
typedef struct RBLE_TIP_TIME_UPDATE_STATE_t{
    uint8_t         current_state;                  Current state
    uint8_t         update_result;                  Time update result
} RBLE_TIP_TIME_UPDATE_STATE;
```

- Set characteristic value information structure

```
typedef struct RBLE_TIPS_WR_DATA_t{
  union Write_Tips_Parameter_u {
```

```
        RBLE_TIP_CURRENT_TIME          current_time;  Current time information
        RBLE_TIP_LOCAL_TIME_INFO       local_time;    Local time information
        RBLE_TIP_REFERENCE_TIME_INFO   ref_time;      Reference time information
        RBLE_TIP_NEXT_TIME_DST_INFO    next_dst;      Time with DST information
        RBLE_TIP_TIME_UPDATE_STATE     update_state;  Time update state information
    }param;
} RBLE_TIPS_WR_DATA;
```

- Current time service content structures

```
typedef struct RBLE_CTS_CONTENT_t{
    uint16_t      shdl;                       Current time service start handle
    uint16_t      ehdl;                       Current time service end handle
    uint16_t      current_time_char_hdl;      Current time characteristic handle
    uint16_t      current_time_val_hdl;       Current time characteristic value
                                              handle
    uint16_t      current_time_cfg_hdl;       Current time client characteristic
                                              configuration descriptor handle
    uint8_t       current_time_prop;          Current time server characteristic
                                              property
    uint8_t       reserved1;                  Reserved
    uint16_t      local_time_info_char_hdl;   Local time information
                                              characteristic handle
    uint16_t      local_time_info_val_hdl;    Local time information
                                              characteristic value handle
    uint8_t       local_time_info_prop;       Local time information
                                              characteristic property
    uint8_t       reserved2;                  Reserved
    uint16_t      ref_time_info_char_hdl;     Reference time information
                                              characteristic handle
    uint16_t      ref_time_info_val_hdl;      Reference time information
                                              characteristic value handle
    uint8_t       ref_time_info_prop;         Reference time information
                                              characteristic property
    uint8_t       reserved3;                  Reserved
}RBLE_CTS_CONTENT;
```

- Next DST change service content structures

```
typedef struct RBLE_NDCS_CONTENT_t {
    uint16_t      shdl;                       Next DST change service start handle
    uint16_t      ehdl;                       Next DST change service end handle
    uint16_t      time_dst_char_hdl;          Time with DST characteristic handle
    uint16_t      time_dst_val_hdl;           Time with DST characteristic value
                                              handle
    uint8_t       time_dst_prop;              Time with DST characteristic
                                              property
    uint8_t       reserved;                   Reserved
```

```
}RBLE_NDCS_CONTENT;
```

- Current time service content structures

```
typedef struct RBLE_RTUS_CONTENT_t {
    uint16_t      shdl;                    Reference time update service start
                                           handle
    uint16_t      ehdl;                    Reference time update service end
                                           handle
    uint16_t      update_cp_char_hdl;      Time update control point
                                           characteristic handle
    uint16_t      update_cp_val_hdl;       Time update control point
                                           characteristic value handle
    uint8_t       update_cp_prop;          Time update control point
                                           characteristic property
    uint8_t       reserved1;               Reserved
    uint16_t      update_state_char_hdl;   Time update state characteristic
                                           handle
    uint16_t      update_state_val_hdl;    Time update state characteristic
                                           value handle
    uint8_t       update_state_prop;       Time update state characteristic
                                           property
    uint8_t       reserved2;               Reserved
}RBLE_RTUS_CONTENT;
```

- TIP Server event parameter structures

```
typedef struct RBLE_TIPS_EVENT_t {
    RBLE_TIP_EVENT_TYPE         type;                  TIP event type
    uint8_t                     reserved;              Reserved
    union Event_Tis_Parameter_u {
        Generic event
        RBLE_STATUS             status;                Status

        Server enable completion event
        struct RBLE_TIP_Server_Enable_t{
            RBLE_STATUS         status;                Status
            uint8_t             reserved;              Reserved
            uint16_t            conhdl;                Connection handle
        }server_enable;

        Server disable completion event
        struct RBLE_TIP_Server_Disable_t{
            uint16_t            conhdl;                Connection handle
            uint16_t            current_time_ntf_en;   Current time notification
                                                       configuration value
        }server_disable;

        Server error indication event
```

```
        struct RBLE_TIP_Server_Error_Ind_t{
            RBLE_STATUS          status;          Status
            uint8_t              reserved;        Reserved
            uint16_t             conhdl;          Connection handle
        }error_ind;

        Server current time value send completion event
        struct RBLE_TIP_Server_Send_Current_Time_t{
            RBLE_STATUS          status;          Status
            uint8_t              reserved;        Reserved
            uint16_t             conhdl;          Connection handle
        }send_measurements;

        Server characteristic value set completion event
        struct BLE_TIP_Server_Write_data_t{
            RBLE_STATUS          status;          Status
            uint8_t              reserved;        Reserved
        }write_data;

        Server control point change indication event
        struct RBLE_TIP_Server_Chg_Cp_Ind_t{
            uint16_t             conhdl;          Connection handle
            uint8_t              update_cp;       Time update control point
                                                  setting
            uint8_t              reserved;        Reserved
        }chg_cp_ind;

        Server configuration characteristic value indication event
        struct RBLE_TIP_Server_Cfg_ntf_Ind_t{
            uint16_t             conhdl;          Connection handle
             uint16_t            cfg_val;         Configuration characteristic
                                                  value
        }cfg_ntf_ind;

        Server command disallowed indication event
        struct RBLE_TIP_Server_Command_Disallowed_Ind_t{
            RBLE_STATUS          status;          Status
            uint8_t              reserved;        Reserved
            uint16_t             opcode;          Opcode
        }cmd_disallowed_ind;
    } param;
} RBLE_TIPS_EVENT;
```

- TIP Client event parameter structures

```
typedef struct RBLE_TIPC_EVENT_t {
    RBLE_TIP_EVENT_TYPE          type;            TIP event type
    uint8_t                      reserved;        Reserved
```

```
union Event_Tic_Parameter_u {
    Generic event
    RBLE_STATUS              status;           Status

    Client enable completion event
    struct RBLE_TIP_Client_Enable_t{
        RBLE_STATUS          status;           Status
        uint8_t              reserved;         Reserved
        uint16_t             conhdl;           Connection handle
        RBLE_CTS_CONTENT     cts;              Current time service content
        RBLE_NDCS_CONTENT    ndcs;             Next DST change service content
        RBLE_RTUS_CONTENT    rtus;             Reference time update service
                                               content
    }client_enable;

    Client disable completion event
    struct RBLE_TIP_Client_Disable_t{
        RBLE_STATUS          status;           Status
        uint8_t              reserved;         Reserved
        uint16_t             conhdl;           Connection handle
    }client_disable;

    Client error indication event
    struct RBLE_TIP_Client_Error_Ind_t{
        RBLE_STATUS          status;           Status
        uint8_t              reserved;         Reserved
        uint16_t             conhdl;           Connection handle
    }error_ind;

    Client current time information notification event
    struct RBLE_TIP_Client_Current_Time_Ntf_t{
        uint16_t              conhdl;          Connection handle
        RBLE_TIP_CURRENT_TIME current_time;    Current time information
    }current_time_ntf;

    Client characteristic value read request response event
    struct RBLE_TIP_Client_Read_Char_Response_t{
        uint16_t             conhdl;           Connection handle
        uint8_t              att_code;         Status
        uint8_t              reserved;         Reserved
        RBLE_ATT_INFO_DATA   data;             Acquired characteristic data
    }rd_char_resp;

    Client characteristic value write request response event
    struct RBLE_TIP_Client_Write_Char_Response_t{
        uint16_t             conhdl;           Connection handle
        uint8_t              att_code;         Status
```

```
            uint8_t                 reserved;         Reserved
        }wr_char_resp;

        Client command disallowed indication event
        struct RBLE_TIP_Client_Command_Disallowed_Ind_t{
            RBLE_STATUS             status;           Status
            uint8_t                 reserved;         Reserved
            uint16_t                opcode;           Opcode
        }cmd_disallowed_ind;
    } param;
} RBLE_TIPC_EVENT;
```

3.2 Functions

The following table shows the API functions defined for the TIP of rBLE and the following sections describe the API functions in detail.

Table 3-1 API Functions Used by the TIP

RBLE_TIP_Server_Enable	Enables the Server role.
RBLE_TIP_Server_Disable	Disables the Server role.
RBLE_TIP_Server_Send_Current_Time	Sends the current time information.
RBLE_TIP_Server_Write_Data	Sets the characteristic value.
RBLE_TIP_Client_Enable	Enables the Client role.
RBLE_TIP_Client_Disable	Disables the Client role.
RBLE_TIP_Client_Read_Char	Reads the characteristic value.
RBLE_TIP_Client_Write_Char	Writes the characteristic value.
RBLE_TIP_Client_Write_Time_Update_CP	Sets the time update control point.

3.2.1 RBLE_TIP_Server_Enable

RBLE_STATUS RBLE_TIP_Server_Enable(uint16_t conhdl, uint8_t sec_lvl, uint8_t con_type, uint16_t current_time_ntf_en, RBLE_TIPS_EVENT_HANDLER call_back)

This function enables the TIP Server role.
If the notification settings of the transmission data is configured from the Client, set the notification setting parameter to 0 to configure the connection. If this setting or information has been specified from the Server, perform a normal connection in accordance with the notification setting parameter.
The result is reported by using the Server role enable completion event RBLE_TIP_EVENT_SERVER_ENABLE_COMP.

Parameters:

conhdl	Connection handle	
sec_lvl	Security level	
con_type	RBLE_PRF_CON_DISCOVERY	Configuration connection
	RBLE_PRF_CON_NORMAL	Normal connection
current_time_ntf_en	RBLE_PRF_STOP_NTFIND	Stop notification of current time information.
	RBLE_PRF_START_NTF	Start notification of current time information.
call_back	Specify the callback function that reports the TIP event.	

Return:

RBLE_OK	Success
RBLE_ERR	Error occurred in Server role enable processing
RBLE_PARAM_ERR	Invalid parameter
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.

3.2.2 RBLE_TIP_Server_Disable

RBLE_STATUS RBLE_TIP_Server_Disable(uint16_t conhdl)		
This function disables the TIP Server role. The result is reported by using the Server role disable completion event RBLE_TIP_EVENT_SERVER_DISABLE_COMP.		
Parameters:		
conhdl	Connection handle	
Return:		
RBLE_OK	Success	
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.3 RBLE_TIP_Server_Send_Current_Time

RBLE_STATUS RBLE_TIP_Server_Send_Current_Time(uint16_t conhdl, RBLE_TIP_CURRENT_TIME *current_time)			
This function sends the current time value data from the server. The result is reported by using the Server role current time value send completion event RBLE_TIP_EVENT_SERVER_SEND_CURRENT_TIME_COMP.			
Parameters:			
conhdl	Connection handle		
**current_time*	*stamp*	*year*	Year (0 : unknown)
		month	Month(0 : unknown)
		day	Day(0 : unknown)
		hour	Hour
		min	Minute
		sec	Second
	day_of_week	RBLE_TIP_TIME_MONDAY	Monday
		RBLE_TIP_TIME_TUESDAY	Tuesday
		RBLE_TIP_TIME_WEDNESDAY	Wednesday
		RBLE_TIP_TIME_THURSDAY	Thursday
		RBLE_TIP_TIME_FRIDAY	Friday
		RBLE_TIP_TIME_SATURDAY	Saturday
		RBLE_TIP_TIME_SUNDAY	Sunday
		RBLE_TIP_TIME_WEEK_UNKNOWN	day of week is unknown
	fraction256	1/256th of a second	
	adjust_reason	Reason of time adjust bit[0] : 0- No manual time update / 1- Manual time update bit[1] : 0- No external reference time update / 1- External reference time update bit[2] : 0- No change of time zone / 1- Change of time zone bit[3] : 0- No change of DST / 1- Change of DST	
Return:			
RBLE_OK	Success		
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.		

3.2.4 RBLE_TIP_Server_Write_Data

RBLE_STATUS RBLE_TIP_Server_Write_Data(uint16_t char_code,
RBLE_TIP_WR_DATA *wr_data)

This function set the characteristic values of the Server.

Specify Characteristic which wants to change a characteristic value into char_code and set data to wr_data in the suitable form.

The result is reported by using the Server role characteristic value set completion event RBLE_TIP_EVENT_SERVER_WRITE_DATA_COMP.

Parameters:

	char_code	RBLE_TIPS_WR_CTS_CRNT_TIME		Current Time Characteristic (Use current_time union)	
		RBLE_TIPS_WR_CTS_LOCAL_TIME		Local Time Information Characteristic (Use local_time union)	
		RBLE_TIPS_WR_CTS_REF_TIME		Reference Time Information Characteristic (Use ref_time union)	
		RBLE_TIPS_WR_NDCS_TIME_DST		Time with DST Characteristic (Use next_dst union)	
		RBLE_TIPS_WR_RTUS_UPDATE_STATUS		Time Update State Characteristic (Use update_state union)	
	**wr_data*	*current_time*	*stamp*	*year*	Year (0：unknown)
				month	Month(0：unknown)
				day	Day(0：unknown)
				hour	Hour
				min	Minute
				sec	Second
			day_of_week	RBLE_TIP_TIME_MONDAY	Monday
				RBLE_TIP_TIME_TUESDAY	Tuesday
				RBLE_TIP_TIME_WEDNESDAY	Wednesday
				RBLE_TIP_TIME_THURSDAY	Thursday
				RBLE_TIP_TIME_FRIDAY	Friday
				RBLE_TIP_TIME_SATURDAY	Saturday
				RBLE_TIP_TIME_SUNDAY	Sunday
				RBLE_TIP_TIME_UNKNOWN	day of week is unknown
			fractions256	1/256th of a second	
			adjust_reason	Reason of time adjust	
		local_time	*time_zone*	Time zone -48：UTC -12:00 -47：UTC -11:45 ・ 0：UTC +00:00 ・ 56：UTC +14:00	
			dst_offset	RBLE_TIP_DST_STANDARD	Standard Time
				RBLE_TIP_DST_HALF_AN_HOUR_DAYLIGHT	Half an hour daylight time (+0.5h)
				RBLE_TIP_DST_DAYLIGHT	Daylight time (+1h)

RBLE_STATUS RBLE_TIP_Server_Write_Data(uint16_t char_code, RBLE_TIP_WR_DATA *wr_data)					
				RBLE_TIP_DST_DOUBLE_DAYLIGHT	Double daylight time (+2h)
				RBLE_TIP_DST_UNKNOWN	DST is not known
		ref_time	*time_source*	RBLE_TIP_TIME_SOURCE_UNKNOWN	Unknown
				RBLE_TIP_TIME_SOURCE_NET_TIME_PRTCL	Network time protocol
				RBLE_TIP_TIME_SOURCE_GPS	GPS
				RBLE_TIP_TIME_SOURCE_RADIO	Radio time signal
				RBLE_TIP_TIME_SOURCE_MANUAL	Manual
				RBLE_TIP_TIME_SOURCE_ATOMIC	Atomic Clock
				RBLE_TIP_TIME_SOURCE_CELLULAR_NET	Cellular Network
			accuracy	Accuracy of time [125ms]	
			days_since_update	Days since update “255” means over 255days.	
			hours_since_update	Hours since update “255” means over 255 days	
		next_dst	*stamp*	year	Year (0：unknown)
				month	Month(0：unknown)
				day	Day(0：unknown)
				hour	Hour
				min	Minute
				sec	Second
			dst_offset	RBLE_TIP_DST_STANDARD	Standard Time
				RBLE_TIP_DST_HALF_AN_HOUR_DAYLIGHT	Half an hour daylight time (+0.5h)
				RBLE_TIP_DST_DAYLIGHT	Daylight time (+1h)
				RBLE_TIP_DST_DOUBLE_DAYLIGHT	Double daylight time (+2h)
				RBLE_TIP_DST_UNKNOWN	DST is not known
		update_state	*current_state*	RBLE_TIP_TIME_UPDATE_IDLE	Idle
				RBLE_TIP_TIME_UPDATE_PENDING	Update pending
			update_result	RBLE_TIP_TIME_UPDATE_SUCCESS	Successful
				RBLE_TIP_TIME_UPDATE_CANCELLED	Canceled
				RBLE_TIP_TIME_UPDATE_NO_CONNECT	No connection to reference

RBLE_STATUS RBLE_TIP_Server_Write_Data(uint16_t char_code, RBLE_TIP_WR_DATA *wr_data)					
				RBLE_TIP_TIME_UPDATE_REF_ERROR	Reference responded with an error
				RBLE_TIP_TIME_UPDATE_TIMEOUT	Timeout
				RBLE_TIP_TIME_UPDATE_NOT_ATTEMPTED	Update not attempted after reset
Return:					
	RBLE_OK			Success	
	RBLE_STATUS_ERROR			Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.5 RBLE_TIP_Client_Enable

RBLE_STATUS RBLE_TIP_Client_Enable(uint16_t conhdl, uint8_t con_type,
RBLE_CTS_CONTENT *cts, RBLE_NDCS_CONTENT *ndcs, RBLE_RTUS_CONTENT *rtus,
RBLE_TIPC_EVENT_HANDLER call_back)

This function enables the TIP Client role and starts access to the service exposed by the TIP Server. The result is reported by using the Client role enable completion event RBLE_TIP_EVENT_CLIENT_ENABLE_COMP.
When starting access to the service exposed by a Server to be connected for the first time, set 0 to the parameters of the service to configure the connection and to discover the service for the Server. If the handle information about the discovered service is saved and is used when the Server is connected normally for a second or subsequent time, detecting the service is skipped, which enables a high-speed access to the service.
While the Client role is enabled, the service exposed by only one Server is accessible. To connect to more than one Server at the same time and access the services exposed by each Server, repeat enable(RBLE_TIP_Client_Enable) / disable(RBLE_TIP_Client_Disable) of the Client role in order to switch access to them. At that time, perform normal connection by using the connection handle (which was obtained when connecting to each Server) and the handle information (which was saved when starting access to the service for the first time) as parameters.

Parameters:

conhdl	Connection handle	
con_type	RBLE_PRF_CON_DISCOVERY	Configuration connection performed when connecting for the first time
	RBLE_PRF_CON_NORMAL	Normal connection performed when connecting for the second and subsequent times
**cts*	*shdl*	Current time service start handle
	ehdl	Current time service end handle
	current_time_char_hdl	Current time characteristic handle
	current_time_val_hdl	Current time characteristic value handle
	current_time_cfg_hdl	Current time client characteristic configuration descriptor handle
	current_time_prop	Current time server characteristic property
	local_time_info_char_hdl	Local time information characteristic handle
	local_time_info_val_hdl	Local time information characteristic value handle
	local_time_info_prop	Local time information characteristic property
	ref_time_info_char_hdl	Reference time information characteristic handle
	ref_time_info_val_hdl	Reference time information characteristic value handle
	ref_time_info_pop	Reference time information characteristic property
**ndcs*	*shdl*	Next DST change service start handle
	ehdl	Next DST change service end handle
	sys_id_char_hdl	Time with DST characteristic handle
	sys_id_val_hdl	Time with DST characteristic value handle
	sys_id_prop	Time with DST characteristic property
**rtus*	*shdl*	Reference time update service start handle
	ehdl	Reference time update service end handle
	update_cp_char_hdl	Time update control point characteristic handle
	update_cp_val_hdl	Time update control point characteristic value handle
	update_cp_prop	Time update control point characteristic property
	update_state_char_hdl	Time update state characteristic handle

		update_state_val_hdl	Time update state characteristic value handle
		update_state_prop	Time update state characteristic property
	call_back	Callback	
Return:			
	RBLE_OK	Success	
	RBLE_ERR	Error occurred in initialization processing	
	RBLE_PARAM_ERR	Invalid parameter	
	RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.6 RBLE_TIP_Client_Disable

RBLE_STATUS RBLE_TIP_Client_Disable(uint16_t conhdl)		
This function disables the TIP Client role and terminates the access to the service exposed by TIP Server. The result is reported by using the Client role disable completion event RBLE_TIP_EVENT_CLIENT_DISABLE_COMP.		
Parameters:		
	conhdl	Connection handle
Return:		
	RBLE_OK	Success
	RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.

3.2.7 RBLE_TIP_Client_Read_Char

RBLE_STATUS RBLE_TIP_Client_Read_Char (uint16_t conhdl, uint8_t char_code)			
This function reads the characteristic value of the current time service, the next DST change service and the reference time update service. The result is reported by using the characteristic value read request response event RBLE_TIP_EVENT_CLIENT_READ_CHAR_RESPONSE.			
Parameters:			
	conhdl	Connection handle	
	char_code	RBLE_TIPC_RD_CTS_CRNT_TIME	Current time
		RBLE_TIPC_RD_CTS_CRNT_TIME_CFG	Current time notification
		RBLE_TIPC_RD_CTS_LOCAL_TIME	Local time information
		RBLE_TIPC_RD_CTS_REF_TIME	Reference time information
		RBLE_TIPC_RD_NDCS_TIME_DST	Time with DST
		RBLE_TIPC_RD_RTUS_UPDATE_STATUS	Time update status
Return:			
	RBLE_OK	Success	
	RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.8 RBLE_TIP_Client_Write_Char

RBLE_STATUS RBLE_TIP_Client_Write_Char(uint16_t conhdl, uint16_t cfg_val)		
This function writes each client characteristic configuration descriptor of the current time service. The result is reported by using the characteristic value write request response event RBLE_TIP_EVENT_CLIENT_WRITE_CHAR_RESPONSE.		
Parameters:		
conhdl	Connection handle	
cfg_val	RBLE_PRF_STOP_NTFIND	Stop notification
	RBLE_PRF_START_NTF	Start notification
Return:		
RBLE_OK	Success	
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.9 RBLE_TIP_Client_Write_Time_Update_CP

RBLE_STATUS RBLE_TIP_Client_Write_Time_Update_CP(uint16_t conhdl, uint8_t time_update_cp)		
This function sets the Time update control point characteristic information of the reference time update service. The result is reported by using the characteristic value write request response event RBLE_TIP_EVENT_CLIENT_WRITE_CHAR_RESPONSE.		
Parameters:		
conhdl	Connection handle	
time_update_cp	RBLE_TIP_CP_REF_UPDATE	Reference update request
	RBLE_TIP_CP_REF_UPDATE_CANCEL	Canceled reference update request
Return:		
RBLE_OK	Success	
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.3 Events

The following table shows the events defined for the TIP of rBLE and the following sections describe the events in detail.

Table 3-2 Events Defined for the TIP

RBLE_TIP_EVENT_SERVER_ENABLE_COMP	Server role enable completion event
RBLE_TIP_EVENT_SERVER_DISABLE_COMP	Server role disable completion event
RBLE_TIP_EVENT_SERVER_ERROR_IND	Server role error indication event
RBLE_TIP_EVENT_SERVER_SEND_CURRENT_TIME_COMP	Current time information send completion event
RBLE_TIP_EVENT_SERVER_WRITE_DATA_COMP	Characteristic value set completion event
RBLE_TIP_EVENT_SERVER_CHG_TIME_UPDATE_CP_IND	Time update control point change indication event
RBLE_TIP_EVENT_SERVER_CFG_NTF_IND	Characteristic value indication event
RBLE_TIP_EVENT_SERVER_COMMAND_DISALLOWED_IND	Server role command disallowed indication event
RBLE_TIP_EVENT_CLIENT_ENABLE_COMP	Client role enable completion event
RBLE_TIP_EVENT_CLIENT_DISABLE_COMP	Client role disable completion event
RBLE_TIP_EVENT_CLIENT_ERROR_IND	Client role error indication event
RBLE_TIP_EVENT_CLIENT_CURRENT_TIME_NTF	Current time notification event
RBLE_TIP_EVENT_CLIENT_READ_CHAR_RESPONSE	Characteristic value read request response event
RBLE_TIP_EVENT_CLIENT_WRITE_CHAR_RESPONSE	Characteristic value write request response event
RBLE_TIP_EVENT_CLIENT_COMMAND_DISALLOWED_IND	Client role command disallowed indication event

3.3.1 RBLE_TIP_EVENT_SERVER_ENABLE_COMP

RBLE_TIP_EVENT_SERVER_ENABLE_COMP	
This event reports the result of enabling the Server role (RBLE_TIP_Server_Enable).	
Parameters:	
status	Result of enabling the Server role (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)
conhdl	Connection handle

3.3.2 RBLE_TIP_EVENT_SERVER_DISABLE_COMP

RBLE_TIP_EVENT_SERVER_DISABLE_COMP		
This event reports the result of disabling the Server role (RBLE_TIP_Server_Disable).		
Parameters:		
conhdl	Connection handle	
current_time_ntf_en	RBLE_PRF_STOP_NTFIND	Stop notification of current time information.
	RBLE_PRF_START_NTF	Start notification of current time information.

3.3.3 RBLE_TIP_EVENT_SERVER_ERROR_IND

RBLE_TIP_EVENT_SERVER_ERROR_IND	
This event indicates an error code unique to the Server role.	
Parameters:	
status	Error code. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)
conhdl	Connection handle

3.3.4 RBLE_TIP_EVENT_SERVER_SEND_CURRENT_TIME_COMP

RBLE_TIP_EVENT_SERVER_SEND_CURRENT_TIME_COMP	
This event reports completion of sending the time value (RBLE_TIP_Server_Send_Current_Time).	
Parameters:	
status	Time value send completion result. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)
conhdl	Connection handle

3.3.5 RBLE_TIP_EVENT_SERVER_WRITE_DATA_COMP

RBLE_TIP_EVENT_SERVER_WRITE_DATA_COMP		
This event reports completion of writing the characteristic value (RBLE_TIP_Server_Write_Data).		
Parameters:		
status	Characteristic value set completion result. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)	

3.3.6 RBLE_TIP_EVENT_SERVER_CHG_TIME_UPDATE_CP_IND

RBLE_TIP_EVENT_SERVER_CHG_TIME_UPDATE_CP_IND		
This event indicates that the value of the time update control point characteristic of the reference time update service has been changed by the Client.		
Parameters:		
conhdl	Connection handle	
cfg_val	RBLE_TIP_TIME_UPDATE_IDLE	Reference update request
	RBLE_TIP_TIME_UPDATE_PENDING	Canceled Reference update request

3.3.7 RBLE_TIP_EVENT_SERVER_CFG_NTF_IND

RBLE_TIP_EVENT_SERVER_CFG_NTF_IND		
This event indicates that the value of the client characteristic configuration descriptor of the current time characteristic has been set by the Client.		
Parameters:		
conhdl	Connection handle	
cfg_val	RBLE_PRF_STOP_NTFIND	Stop notification/ indication.
	RBLE_PRF_START_NTF	Start notification

3.3.8 RBLE_TIP_EVENT_SERVER_COMMAND_DISALLOWED_IND

RBLE_TIP_EVENT_SERVER_COMMAND_DISALLOWED_IND		
This event indicates the error that occurs when a command executed by the Server role cannot be accepted.		
Parameters:		
status	Result of command execution. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)	
opcode	RBLE_CMD_TIP_SERVER_ENABLE	Server role enable command
	RBLE_CMD_TIP_SERVER_DISABLE	Server role disable command
	RBLE_CMD_TIP_SERVER_SEND_CURRENT_TIME	Current time send command
	RBLE_CMD_TIP_SERVER_WRITE_DATA	Characteristic value set command

3.3.9 RBLE_TIP_EVENT_CLIENT_ENABLE_COMP

RBLE_TIP_EVENT_CLIENT_ENABLE_COMP		
This event reports the result of enabling the Client role (RBLE_TIP_Client_Enable). Save the obtained handle information about the discovered service, to enable a high-speed access to the service without service detection when restarting access to the service.		
Parameters:		
status	Result of disabling the Client role. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)	
conhdl	Connection handle	
cts	*shdl*	Current time service start handle
	ehdl	Current time service end handle
	current_time_char_hdl	Current time characteristic handle
	current_time_val_hdl	Current time characteristic value handle
	current_time_cfg_hdl	Current time client characteristic configuration descriptor handle
	current_time_prop	Current time server characteristic property
	local_time_info_char_hdl	Local time information characteristic handle
	local_time_info_val_hdl	Local time information characteristic value handle
	local_time_info_prop	Local time information characteristic property
	ref_time_info_char_hdl	Reference time information characteristic handle
	ref_time_info_val_hdl	Reference time information characteristic value handle
	ref_time_info_pop	Reference time information characteristic property
ndcs	*shdl*	Next DST change service start handle
	ehdl	Next DST change service end handle
	sys_id_char_hdl	Time with DST characteristic handle
	sys_id_val_hdl	Time with DST characteristic value handle
	sys_id_prop	Time with DST characteristic property
rtus	*shdl*	Reference time update service start handle
	ehdl	Reference time update service end handle
	update_cp_char_hdl	Time update control point characteristic handle
	update_cp_val_hdl	Time update control point characteristic value handle
	update_cp_prop	Time update control point characteristic property
	update_state_char_hdl	Time update state characteristic handle
	update_state_val_hdl	Time update state characteristic value handle
	update_state_prop	Time update state characteristic property

3.3.10 RBLE_TIP_EVENT_CLIENT_DISABLE_COMP

RBLE_TIP_EVENT_CLIENT_DISABLE_COMP	
This event reports the result of disabling the Client role (RBLE_TIP_Client_Disable).	
Parameters:	
status	Result of disabling the Client role. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)
conhdl	Connection handle

3.3.11 RBLE_TIP_EVENT_CLIENT_ERROR_IND

RBLE_TIP_EVENT_CLIENT_ERROR_IND	
This event indicates an error code unique to the TIP Client role.	
Parameters:	
status	Error code. (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)
conhdl	Connection handle

3.3.12 RBLE_TIP_EVENT_CLIENT_CURRENT_TIME_NTF

RBLE_TIP_EVENT_CLIENT_CURRENT_TIME_NTF				
This event indicates the time value sent from the Server.				
Parameters:				
conhdl	Connection handle			
current_time	*stamp*	*year*	Year (0：unknown)
		month	Month(0：unknown)
		day	Day(0：unknown)
		hour	Hour
		min	Minute
		sec	Second
	day_of_week	RBLE_TIP_TIME_MONDAY	Monday
		RBLE_TIP_TIME_TUESDAY	Tuesday
		RBLE_TIP_TIME_WEDNESDAY	Wednesday
		RBLE_TIP_TIME_THURSDAY	Thursday
		RBLE_TIP_TIME_FRIDAY	Friday
		RBLE_TIP_TIME_SATURDAY	Saturday
		RBLE_TIP_TIME_SUNDAY	Sunday
		RBLE_TIP_TIME_WEEK_UNKNOWN	day of week is unknown
	fraction256	1/256th of a second	
	adjust_reason	Reason of time adjust bit[0]：0- No manual time update / 1- Manual time update ● bit[1]：0- No external reference time update / 1- External reference time update bit[2]：0- No change of time zone / 1- Change of time zone bit[3]：0- No change of DST / 1- Change of DST	

3.3.13 RBLE_TIP_EVENT_CLIENT_READ_CHAR_RESPONSE

RBLE_TIP_EVENT_CLIENT_READ_CHAR_RESPONSE

This event reports the response to the characteristic value read request (RBLE_TIP_CLIENT_Read_Char). Read out the read data in accordance with the contents of the request.

RBLE_TIPC_RD_CTS_CRNT_TIME

LSB

Octet0	Octet1	Octet2	Octet4	Octet5	Octet6
year (lower)	*year (upper)*	*month*	*day*	*hour*	*min*
Octet7	Octet8	Octet9	Octet10	Octet11	Octet12
sec	*day_of_ week*	*fraction256*	*adjust_ reason*	-	-

MSB

RBLE_TIPC_RD_CTS_CRNT_TIME_CFG

LSB

Octet0	Octet1	Octet2	Octet4	Octet5	Octet6
client configuration (lower)	*client configuration (upper)*	-	-	-	-

MSB

RBLE_TIPC_RD_CTS_LOCAL_TIME

LSB

Octet0	Octet1	Octet2	Octet4	Octet5	Octet6
time zone	*daylight saving time*	-	-	-	-

MSB

RBLE_TIPC_RD_CTS_REF_TIME

LSB

Octet0	Octet1	Octet2	Octet4	Octet5	Octet6
source	*accuracy*	*days since update*	*hours since update*	-	-

MSB

RBLE_TIPC_RD_NDCS_TIME_DST

LSB

Octet0	Octet1	Octet2	Octet4	Octet5	Octet6
year (lower)	*year (upper)*	*month*	*day*	*hour*	*min*
Octet7	Octet8	Octet9	Octet10	Octet11	Octet12
sec	*DST offset*	-			-

MSB

RBLE_TIPC_RD_RTUS_UPDATE_STATUS

LSB

Octet0	Octet1	Octet2	Octet4	Octet5	Octet6
current state	*result*	-	-	-	-

MSB

Parameters:

conhdl	Connection handle		
att_code	0x00	Characteristic value successfully acquired	
	Other than 0x00	Error occurred when acquiring characteristic value	
data	*each_len*		Length of each result
	len		Data length
	data[RBLE_ATTM_MAX_VALUE]		Read characteristic data

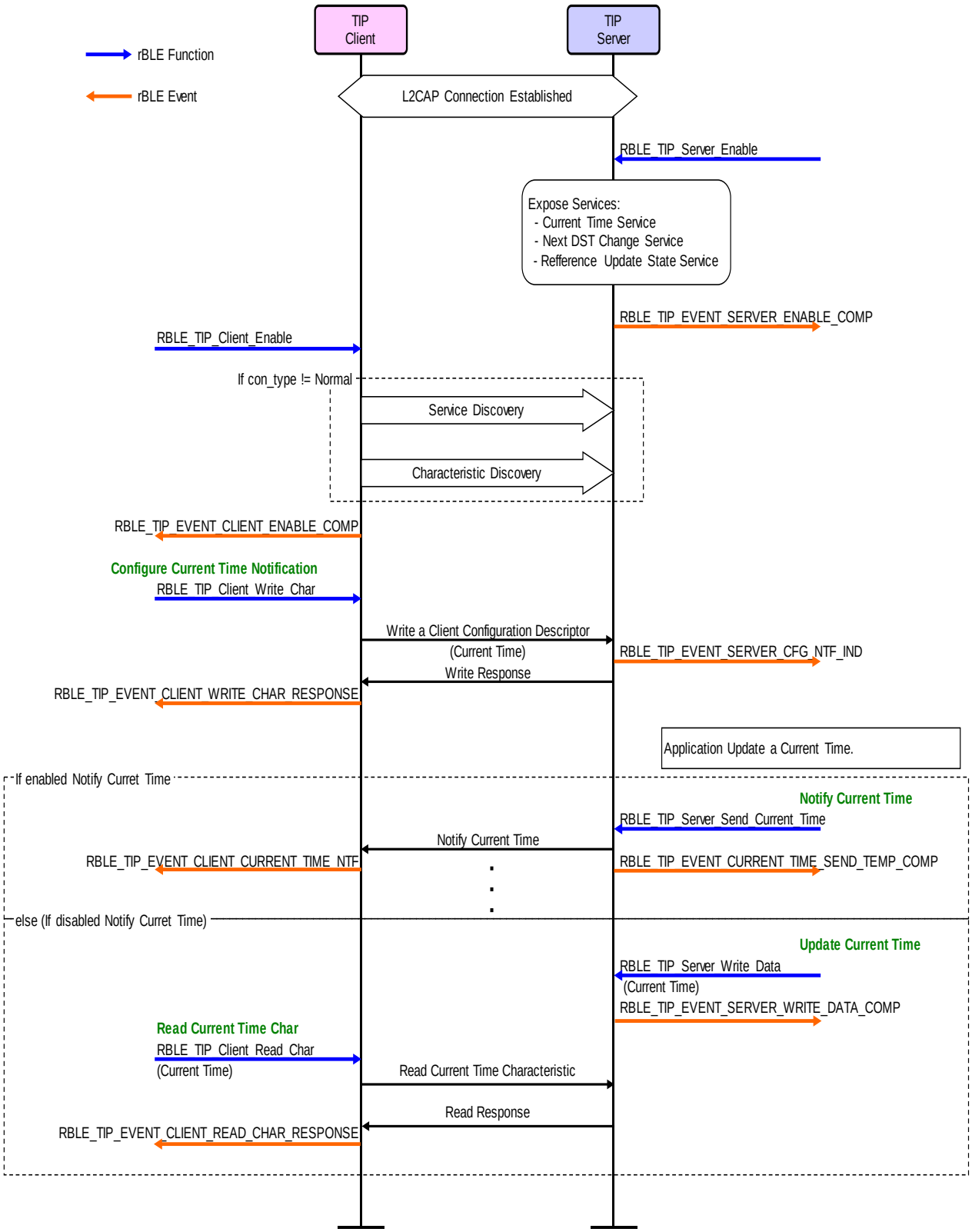
3.3.14 RBLE_TIP_EVENT_CLIENT_WRITE_CHAR_RESPONSE

RBLE_TIP_EVENT_CLIENT_WRITE_CHAR_RESPONSE			
This event reports the response to the characteristic value write request (RBLE_TIP_Client_Write_Char).			
Parameters:			
	conhdl	Connection handle	
	att_code	0x00	Characteristic value successfully written
		Other than 0x00	Error occurred when writing characteristic value

3.3.15 RBLE_TIP_EVENT_CLIENT_COMMAND_DISALLOWED_IND

RBLE_TIP_EVENT_CLIENT_COMMAND_DISALLOWED_IND			
This event indicates the error that occurs when a command executed by the Client role cannot be accepted.			
Parameters:			
	status	Result of command execution (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status*.)	
	opcode	RBLE_CMD_TIP_CLIENT_ENABLE	Client role enable command
		RBLE_CMD_TIP_CLIENT_DISABLE	Client role disable command
		RBLE_CMD_TIP_CLIENT_READ_CHAR	Characteristic read command
		RBLE_CMD_TIP_CLIENT_WRITE_CHAR	Characteristic write command
		RBLE_CMD_TIP_CLIENT_WRITE_TIME_UPDATE_CP	Control point write command

3.4 Message Sequence Chart



4. Notes

Appendix A How to Read Definition Tables

This section shows how to read the tables that describes the rBLE API functions and events shown in this document.

A.1 How to Read Function Definition Tables

The following contents are included in the function definition tables:

The Parameters area describes the parameters specified for the function.
The italicized character strings on the left are the parameters of the function.
The meaning of each parameter is described on the far right following the variables.

The italicized character string(s) next to each parameter indicate the member(s) of the parameter (structure).

The values that can be specified for the parameter might be described between the parameter name and its description.

The function definition is shown at the top of the table in the row with the light green background. This area shows the function prototype.				
The operation of the function and the event reported after executing the function are described in this area.				
Parameters:				
	Parameter 1	Description of parameter 1		
	Parameter 2	*Member 1*	Value 1 that can be specified for member 1	Description of value 1 that can be specified for member 1
			Value 1 that can be specified for member 2	Description of value 1 that can be specified for member 2
		Member 2	Description of member 2	
Return:				
	Value 1 that might be returned	Description of value 1 that might be returned		
	Value 2 that might be returned	Description of value 2 that might be returned		

The Return area describes the values returned for the function.
The leftmost row shows the value that might be returned, and the next row describes the return value.

A.2 How to Read Event Definition Tables

The following contents are included in the event definition tables:

The Parameters area describes the parameters specified for the event.
The italicized character strings on the left show the parameters of the event parameter structure. The meaning of each parameter is described on the far right.

The italicized character string(s) next to each parameter indicate the member(s) of the parameter (structure).

The event definition is shown at the top of the table in the row with the orange background. This area shows the event type.			
The information reported by the event is described in this area.			
Parameters:			
	Parameter 1	Description of parameter 1	
	Parameter 2	*Member 1*	Description of member 1
		Member 2	Description of member 2
		Member 3	Description of member 3
	Parameter 3	Value 1 that can be specified for parameter 3	Description of value 1 that can be specified for parameter 3
		Value 2 that can be specified for parameter 3	Description of value 2 that can be specified for parameter 3

The values that can be specified for the parameter might be shown between the parameter name and its description.

Appendix B Referenced Documents

1. Bluetooth Core Specification v4.0, Bluetooth SIG
2. Find Me Profile Specification v1.0, Bluetooth SIG
3. Immediate Alert Service Specification v1.0, Bluetooth SIG
4. Proximity Profile Specification v1.0, Bluetooth SIG
5. Link Loss Service Specification v1.0, Bluetooth SIG
6. Tx Power Service Specification v1.0, Bluetooth SIG
7. Health Thermometer Profile Specification v1.0, Bluetooth SIG
8. Health Thermometer Service Specification v1.0, Bluetooth SIG
9. Device Information Service Specification v1.1, Bluetooth SIG
10. Blood Pressure Profile Specification v1.0, Bluetooth SIG
11. Blood Pressure Service Specification v1.0, Bluetooth SIG
12. HID over GATT Profile Specification v1.0, Bluetooth SIG
13. HID Service Specification v1.0, Bluetooth SIG
14. Battery Service Specification v1.0, Bluetooth SIG
15. Scan Parameters Profile Specification v1.0, Bluetooth SIG
16. Scan Parameters Service Specification v1.0, Bluetooth SIG
17. Heart Rate Profile Specification v1.0, Bluetooth SIG
18. Heart Rate Service Specification v1.0, Bluetooth SIG
19. Cycling Speed and Cadence Profile Specification v1.0, Bluetooth SIG
20. Cycling Speed and Cadence Service Specification v1.0, Bluetooth SIG
21. Cycling Power Profile Specification v0.9, Bluetooth SIG
22. Cycling Power Service Specification v0.9, Bluetooth SIG
23. Glucose Profile Specification v1.0, Bluetooth SIG
24. Glucose Service Specification v1.0, Bluetooth SIG
25. Time Profile Specification v1.0, Bluetooth SIG
26. Current Time Service Specification v1.0, Bluetooth SIG
27. Next DST Change Service Specification v1.0, Bluetooth SIG
28. Reference Time Update Service Specification v1.0, Bluetooth SIG
29. Bluetooth SIG Assigned Numbers https://www.bluetooth.org/Technical/AssignedNumbers/home.htm
30. Services & Characteristics UUID http://developer.bluetooth.org/gatt/Pages/default.aspx
31. Personal Health Devices Transcoding White Paper v1.2, Bluetooth SIG

Appendix C Terminology

Term	Description
Service	A service is provided from a GATT server to a GATT client. The GATT server exposes some characteristics as the interface. The service prescribes how to access the exposed characteristics.
Profile	A profile enables implementation of a use case by using one or more services. The services used are defined in the specifications of each profile.
Characteristic	A characteristic is a value used to identify services. The characteristics to be exposed and their formats are defined by each service.
Role	Each device takes the role prescribed by the profile or service in order to implement the specified use case.
Client Characteristic Configuration Descriptor	A descriptor is used to control notifications or indications of characteristic values that include the client characteristic configuration descriptor sent from the GATT server.
Server Characteristic Configuration Descriptor	A descriptor is used to control broadcast of characteristic values that include the server characteristic configuration descriptor sent from the GATT server.
Connection Handle	The handle determined by the controller stack and is used to identify connection with a remote device. The valid handle range is between 0x0000 and 0x0EFF.

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Rev.	Date	Description	
		Page	Summary
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Renesas Electronics America Inc.
2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HALII Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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