

**Research & Vehicle Technology**

**“Infotainment Systems Product Development”**

**Feature – APIM Clock Strategy**

**APIM Infotainment Subsystem Part Specific Specification (SPSS)**

Version 1.4

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**Version Date:  February 6, 2015**

**FORD CONFIDENTIALF**

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Version** | **Notes** | |
| **May 30, 2013** | **1.0** | **Initial Release** |  |
|  |  |  |  |
| **October 22, 2013** | **1.1** | **Updated Release** |  |
|  | CLK-GFUN-294357-2-APIM Clock Strategy | | rpaquet2 - Added 3 new requirements 304333, 304334 and 304335. Removed requirements 294358, 294401 and 294407. |
|  | CLK-GREQ-304333-1-Slave Clock 3 | | rpaquet2 - New Requirement |
|  | CLK-GREQ-304334-1-Daylight Savings Time 1 | | rpaquet2 - New requirement |
|  | CLK-GREQ-304335-1-Daylight Savings Time 2 | | rpaquet2 - New requirement |
|  |  |  |  |
| **March 19, 2014** | **1.2** | **Updated Release** |  |
|  | CLK-FUR-REQ-017531/B-Automatic GPS Setting 2(TcSE ROIN-294411-1) | | <Alabbas Al Dallal>   adding reference to requirement LOCATN-REQ-022451 |
|  | CLK-FUR-REQ-017545/A-User Configurable Settings(TcSE ROIN-294425-2) | | rpaquet2 - Updated requirement |
|  |  |  |  |
| **July 18, 2014** | **1.3** | **Updated Release** |  |
|  | STR-059810/B-Scenarios (TcSE ROIN-294367-1) | | Added new requirement for GPS UTC Date/Time |
|  | CLK-FUR-REQ-092310/A-GPS UTC time | | new requirement |
|  |  |  |  |
| **February 6, 2015** | **1.4** | **Updated Release** |  |
|  | CLK-FUR-REQ-017548/B-Default Time Zone Table (TcSE ROIN-294428-1) | | <Alabbas > update the time zone table with correct time zones for ROW |

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# Functional Definition

## CLK-FUN-REQ-017521/A-APIM Clock Strategy (TcSE ROIN-294357-2)

This document will describe the implementation of the global clock strategy on the SYNC platform. It is necessary to understand the "Global Clock Strategy Speciification" before reading this spec.

### Requirements

#### Goals

Abilitiy to act as the clock master in the vehicle

Abilitiy to act as the clock slave in the vehicle

#### Scenarios

##### CLK-FUR-REQ-017522/A-Master Clock (TcSE ROIN-294360-1)

When configured to act as the clock master then the Plugin will periodically send out a MFD\_DateTime message across CAN to update the slave clocks. The frequency of the message will be configurable.

##### CLK-FUR-REQ-017523/A-Master Clock 2 (TcSE ROIN-294397-1)

When configured to act as the clock master then the Plugin will: If the frequency is set to a special value then the MFD\_DateTime message will not be sent out (for CGEA 1.2).

##### CLK-FUR-REQ-017524/A-Master Clock 3 (TcSE ROIN-294398-1)

When configured to act as the clock master then the Plugin will receive and process the TimeAdjustReq message. This message will allow slave clocks to set the master clock. After receiving the TimeAdjustReq message the service will immediately start broadcasting the new time. See the API section for the message format.

##### CLK-FUR-REQ-017525/A-Slave Clock (TcSE ROIN-294399-1)

Receive and process the XXX\_DateTime message. This will update the SYNCII system time.

##### CLK-FUR-REQ-017526/A-Slave Clock 2 (TcSE ROIN-294400-1)

Transmit the TimeAdjustReq message when indicated to do so by the HMI plugin code. Note that this message will actually be sent out twice – once to indicate that the master clock should be updated with a new time, and again to indicate that the slave has received and agrees with the new time from the master.

##### CLK-FUR-REQ-017527/A-Slave Clock 3 (TcSE ROIN-304333-1)

The module shall be responsible for comparing master time to GPS time once per key cycle and correct the master time in the event of drift.

##### CLK-FUR-REQ-017528/A-Displaying Date (TcSE ROIN-294402-1)

The date must be adjusted based on the current time of the clock master (i.e. on the transition from 11:59pm to 12:00am will move to the next calendar date). Note: This also applies on the transition to the previous day (i.e. the transition for 12:00am to 11:59pm).

##### CLK-FUR-REQ-017529/A-Setting Time (SYNC is not Master) (TcSE ROIN-294408-1)

When the user changes the time via the HMI then the plugin will send a message to the with the time change request. The HMI at this point will only display the time set by the user, w/o consulting the system clock. The plugin will send a TimeAdjustReq message via the CAN bus with a flag set indicating the required time/date update. When the plugin receives an XXX\_DateTime message that agrees with the user time (within 5 seconds) then the HMI will resume displaying the normal system time. The plugin will send a new TimeAdjustReq message with the date/time flags reset to 0.

##### CLK-FUR-REQ-017530/A-Automatic GPS Setting (TcSE ROIN-294410-1)

If a GPS module is present on the vehicle then it should send out a signal over the CAN bus that includes the current time as received from acquired satellites (in UTC). The user will be able to choose to have the vehicle time synchronized with the GPS module’s UTC time (via HMI).

##### CLK-FUR-REQ-017531/B-Automatic GPS Setting 2 (TcSE ROIN-294411-1)

If Sync detects that the GPS module is sending time values that are invalid Sync shall immediately disregard GPS time data and continue keeping time from the last known, good UTC value sent. Sync shall not reference GPS time again for time keeping purposes until it receives a valid UTC time value.

Sync shall immediately disregard GPS time data and continue keeping time from the last known, good UTC value sent if any of the below parameters move into the invalid range:

|  |  |
| --- | --- |
| **Signals in MSCAN message 0x466 – \_GPS\_Data\_Nav\_2** | |
| **Signal Name** | **Invalid when greater than or equal to** |
| GPS\_UTC\_hours | 0x18 |
| GPS\_UTC\_minutes | 0x3C |
| GPS\_UTC\_seconds | 0x3C |

These rules shall apply to configurations where navigation is either “ON” or “OFF” and Sync is either the clock master or slave but is ONLY in effect when the GPS module is sending time values that are invalid.

During this scenario Sync shall rely on the internal clock to keep   time during suspend/resume cycles and system reboots of any kind and shall not reference GPS time again until all values are within valid range.

 During Shunting, Sync shall follow LOCATN-REQ-022451-Shunting which can be found in the location SPSS.

##### CLK-FUR-REQ-017532/A-Daylight Savings Time 1 (TcSE ROIN-304334-1)

The module shall be responsible for maintaining daylight savings time (DST) based on GPS position and date.

##### CLK-FUR-REQ-017533/A-Daylight Savings Time 2 (TcSE ROIN-304335-1)

The module shall be responsible for providing over the air (OTA) updates to DST calculations as DST standards are adjusted.

##### CLK-FUR-REQ-017534/A-GPS Time Synchronization (TcSE ROIN-294412-1)

The GPS Time Synchronization pushbutton shall function as a momentary button press that will allow the user to reset any previously added user bias to the clock back to 00:00.  When pressed the parameter in SYNCClockSVC called UserBias shall reset itself to 0 min (00:00).  Thus, as an example if a user in the Eastern Standard time zone pushed the GPS Time Synchronization pushbutton the following line in a retail log shall look like below:

SyncClockSvc!RecoverTimeAfterReboot:  Bias = 300 (300 TZ + 0 DST + 0 User)

##### CLK-FUR-REQ-017535/A-Default Time Zone (TcSE ROIN-294413-1)

The module shall implement a default time zone setting that will be configurable based on region.  The region can be determined from the country code configuration in DE01, bytes 1 and 2.  The default time zone is already implemented in current production MYEarly 2011 software but is hard coded to EST(UTC – 05:00).  The configurable default time zones will be added to reduce customer confusion in global regions such as Europe, Asia Pacific, South America and the GCC.  Table 3 in the references section should be used to associate default time zones with the correct country code.

##### CLK-FUR-REQ-017536/A-Default Time Zone 2 (TcSE ROIN-294414-1)

The default time zone will be applied to the displayed clock time regardless of whether the navigation application is installed or not.

##### CLK-FUR-REQ-017537/A-Default Time Zone 3 (TcSE ROIN-294416-1)

The default time zone can be replaced by a time zone sent from the navigation application when the Auto Time Zone Update option is turned ON.

##### CLK-FUR-REQ-017538/A-Default Time Zone 4 (TcSE ROIN-294418-1)

If the country code of the module is set to 00 00 or if the country code configurtions do not match any of the codes shown in Table 3. then the time zone default shall be set to UTC+0 or 0.

##### CLK-FUR-REQ-017539/A-Default Time Zone 5 (TcSE ROIN-294419-1)

The time zone value will always update to the new value set into the configurartion after every reboot.

##### CLK-FUR-REQ-017540/A-Clock Slave (TcSE ROIN-294420-1)

When SYNC is configured as the clock slave it must not send out a request to adjust time automatically if the GPS data contained in 0x467 GPS\_Nav\_Data equals the following for greater than 5s:

|  GPS\_dimension         **<** 1

**OR**

        |  GPS\_Sat\_num\_in\_view   **<**  4

During these states the SYNC module must continue keeping time using the clock master time and rely on the clock master time when making time adjust requests.

##### CLK-FUR-REQ-017541/A-Clock Master (TcSE ROIN-294421-1)

When Sync is configured as the clock master and the GPS data contained in 0x467 GPS\_Nav\_Data equals the following for greater than 5s:

|  GPS\_dimension         **<** 1

**OR**

        |  GPS\_Sat\_num\_in\_view   **<**  4

SYNC must immediately disregard GPS time data and continue keeping time from the last known, good UTC value sent.  During these states the SYNC module must continue keeping time using its own internal clock for time keeping purposes.

##### CLK-FUR-REQ-092310/A-GPS UTC time

The module shall be responsible for sending the GPS UTC\_time and UTC\_Date based on the GPS information received from the Satellites. Upon bus a wake this information shall be sent through the CAN Bus with accurate timing using the RTC data until valid GPS data is receive.  Once valid GPS data is received the signals shall be populated with the GPS data.

In case the module loses the GPS signal completely the module shall populate UTC\_time and UTC\_Date with the modules RTC date and Time without applying the user or time zone bias.

#### Power State Requirements

##### CLK-FUR-REQ-017542/A-Power Requirement (TcSE ROIN-294422-1)

The user interaction portion (display and setting of the time) is only available in interactive power modes.

##### CLK-FUR-REQ-017543/A-Power Requirement 2 (TcSE ROIN-294423-1)

If acting as master, SYNC clock operation will not depend on CAN-awake mode.

##### CLK-FUR-REQ-017544/A-Power Requirement 3 (TcSE ROIN-294424-1)

If acting as only a slave, when the CAN bus is asleep then SYNC will use its internal clock for display.

#### HMI Requirements

##### CLK-FUR-REQ-017545/A-User Configurable Settings (TcSE ROIN-294425-2)

These settings will be stored and accessed via Data manager:

            12/24 hour display mode

            Automatic GPS clock setting

            Clock display state(time, date)

            Auto Time Zone

##### CLK-FUR-REQ-017546/A-EOL Configurable Settings (TcSE ROIN-294426-1)

These settings are configured at EOL through Inbound diagnostics:

            Master clock mode

            Delay between MFD\_DateTime messages

            Date format string (reference A73d)

##### CLK-FUR-REQ-017547/B-Provisioning Requirement (TcSE ROIN-294427-1)

The initial state of the clock when power is applied will be 12:00:00 01/01/2014.

#### References

##### CLK-FUR-REQ-017548/B-Default Time Zone Table (TcSE ROIN-294428-1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Destination Country | WERS country code | 2 letter Destination Code | Byte1,Byte2 to be downloaded in ECU | Default Time Zone |
| ARUBA | WSSAB | AA | 0x4141 | UTC - 04:00 |
| ANTIGUA & BARBUDA | WSIAA | AC | 0x4143 | UTC - 04:00 |
| ARGENTINA | WASAB | AR | 0x4152 | UTC - 03:00 |
| ANGUILLA | WSIAY | AT | 0x4154 | UTC - 04:00 |
| AY ANTARCTICA |  | AY | 0x4159 | UTC +01:00 |
| BARBADOS | WSIAC | BB | 0x4242 | UTC - 04:00 |
| BAHAMAS | WSIAB | BF | 0x4246 | UTC - 05:00 |
| BELIZE | WSCAB | BH | 0x4248 | UTC - 06:00 |
| BOLIVIA | WSSAC | BL | 0x424C | UTC - 04:00 |
| SOLOMON ISLANDS | WSPAV | BP | 0x4250 | UTC +11:00 |
| BQ NAVASSA ISLAND |  | BQ | 0x4251 | UTC - 05:00 |
| BRAZIL | WASAC | BR | 0x4252 | UTC - 03:00 |
| BV BOUVET ISLAND |  | BV | 0x4256 | UTC 00:00 |
| CHILE | WSSAE | CI | 0x4349 | UTC - 04:00 |
| CAYMAN ISLAND | WSIAT | CJ | 0x434A | UTC - 05:00 |
| CK COCOS ISLANDS |  | CK | 0x434B | UTC - 06:30 |
| COLOMBIA | WSSAF | CO | 0x434F | UTC - 05:00 |
| NORTHERN MARIANA ISLANDS | WATAC | CQ | 0x4351 | UTC +11:00 |
| CR CORAL SEA ISLAND |  | CR | 0x4352 | UTC +10:00 |
| COSTA RICA | WSCAC | CS | 0x4353 | UTC - 06:00 |
| CUBA | WSICA | CU | 0x4355 | UTC - 05:00 |
| COOK ISLANDS | WSPCB | CW | 0x4357 | UTC - 10:00 |
| DOMINICA | WSIAE | DO | 0x444F | UTC - -04:00 |
| DOMINICAN REPUBLIC | WSIAF | DR | 0x4452 | UTC - 04:00 |
| ECUADOR | WSSAH | EC | 0x4543 | UTC - 05:00 |
| EL SALVADOR | WSCAD | ES | 0x4553 | UTC - 06:00 |
| FRENCH GUIANA | WSSAJ | FG | 0x4647 | UTC - 03:00 |
| FALKLAND ISLANDS | WSSAI | FK | 0x464B | UTC - 03:00 |
| GRENADA | WSIAG | GJ | 0x474A | UTC - 04:00 |
| GUADELOUPE | WSIAH | GP | 0x4750 | UTC - 04:00 |
| GUATEMALA | WSCAE | GT | 0x4754 | UTC - 06:00 |
| GUYANA | WSSAK | GY | 0x4759 | UTC - 04:00 |
| HAITI | WSIAI | HA | 0x4841 | UTC - 05:00 |
| HONDURAS | WSCAF | HO | 0x484F | UTC - 06:00 |
| JAMAICA | WSIAJ | JM | 0x4A4D | UTC - 05:00 |
| KIRIBATI | WSPCR | KR | 0x4B52 | UTC +12:00 |
| KT CHRISTMAS ISLAND |  | KT | 0x4B54 | UTC +07:00 |
| MARTINIQUE | WSIAK | MB | 0x4D42 | UTC - 04:00 |
| MONSERRAT | WSIAU | MH | 0x4D48 | UTC - 04:00 |
| SURINAM | WSSAN | NS | 0x4E53 | UTC - 03:00 |
| NETHERLANDS ANTILLES | WSIA1 | NT | 0x4E54 | UTC - 04:00 |
| NICARAGUA | WSCAG | NU | 0x4E55 | UTC - 06:00 |
| PARAGUAY | WSSAL | PA | 0x5041 | UTC - 04:00 |
| PERU | WSSAM | PE | 0x5045 | UTC - 05:00 |
| PANAMA | WSCAH | PM | 0x504D | UTC - 05:00 |
| ST. KITTS & NEVIS | WSIAL | SC | 0x5343 | UTC - 04:00 |
| ST. LUCIA | WSIAM | ST | 0x5354 | UTC - 04:00 |
| TRINIDAD & TOBAGO | WSIAR | TD | 0x5444 | UTC - 04:00 |
| URUGUAY | WSSAP | UY | 0x5559 | UTC - 03:00 |
| ST. VINCENT & THE GRENADINES | WSIAN | VC | 0x5643 | UTC - 04:00 |
| VENEZUELA | WASAD | VE | 0x5645 | UTC - 04:30 |
| BRITISH VIRGIN ISLANDS | WSIAS | VI | 0x5649 | UTC - 04:00 |
| United States of America |  | US | 0x5553 | UTC - 05:00 |
| Military (treat as US) |  | 2BLANK | 0x3220 | UTC - 05:00 |
| Military (treat as US) |  | 3BLANK | 0x3320 | UTC - 05:00 |
| Military (treat as US) |  | 7 BLANK | 0x3720 | UTC - 05:00 |
| GSA (typically treat as US) |  | BLANKBLANK | 0x2020 | UTC - 05:00 |
| AMERICAN SAMOA | WATAF | AQ | 0x4151 | UTC - 11:00 |
| BERMUDA | WSIAD | BD | 0x4244 | UTC - 04:00 |
| CANADA | WANAC | CA | 0x4341 | UTC - 05:00 |
| DQ JARVIS ISLAND |  | DQ | 0x4451 | UTC - 11:00 |
| MICRONESIA | WAPAG | FM | 0x464D | UTC - +11:00 |
| FQ BAKER ISLAND |  | FQ | 0x4651 | UTC - 12:00 |
| GUAM-U.S. TERR. (USE WATAB) | WANAF | GQ | 0x4751 | UTC +11:00 |
| JQ JOHNSON ATOLL |  | JQ | 0x4A51 | UTC - 10:00 |
| KQ KINGMAN REEF |  | KQ | 0x4B51 | UTC - 11:00 |
| LQ PALMYRA ATOLL |  | LQ | 0x4C51 | UTC - 11:00 |
| MQ MIDWAY ISLAND |  | MQ | 0x4D51 | UTC - 11:00 |
| PALAU | WAPAH | PS | 0x5053 | UTC +10:00 |
| PUERTO RICO (USE WATAE) | WANAJ | RQ | 0x5251 | UTC - 04:00 |
| SX S GEO/S SWADWIC |  | SX | 0x5358 | UTC - 02:00 |
| UM US MINOR OUTLYING ISLANDS |  | UM | 0x554D | UTC +12:00 |
| US VIRGIN ISLANDS | WATAD | VQ | 0x5651 | UTC - 04:00 |
| WQ WAKE ISLAND |  | WQ | 0x5751 | UTC - +12:00 |
| ALBANIA | WSEAY | AL | 0x414C | UTC +01:00 |
| TAHITI | WSIAP | FP | 0x4650 | UTC - 10:00 |
| MEXICO | WANAD | MX | 0x4D58 | UTC - 06:00 |
| PC PITCAIRN ISLAND |  | PC | 0x5043 | UTC - 08:00 |
| PAPUA | WSPAQ | PP | 0x5050 | UTC +10:00 |
| TURKS & CAICOS ISLANDS | WSICB | TK | 0x544B | UTC - 05:00 |
| ANDORRA | WSEAB | AN | 0x414E | UTC + 01:00 |
| AUSTRIA | WAEAX | AU | 0x4155 | UTC + 01:00 |
| BELGIUM | WAEBX | BE | 0x4245 | UTC + 01:00 |
| BOSNIA | WSEAX | BK | 0x424B | UTC + 01:00 |
| BULGARIA | WSEAP | BU | 0x4255 | UTC + 02:00 |
| CYPRUS | WSPAE | CY | 0x4359 | UTC + 02:00 |
| DENMARK | WAEDK | DA | 0x4441 | UTC + 01:00 |
| IRELAND | WAEIR | EI | 0x4549 | UTC + 00:00 |
| CZECH REPUBLIC | WSEAT | EZ | 0x455A | UTC + 01:00 |
| FINLAND | WAESF | FI | 0x4649 | UTC + 02:00 |
| FAEROE ISLANDS | WSEAE | FO | 0x464F | UTC + 00:00 |
| FRANCE | WAEFX | FR | 0x4652 | UTC + 01:00 |
| FRENCH SOUTH. ANTARCTIC LANDS | WSABH | FS | 0x4653 | UTC + 05:00 |
| GIBRALTAR | WSEAF | GI | 0x4749 | UTC + 01:00 |
| GK GUERNSEY |  | GK | 0x474B | UTC + 00:00 |
| GREENLAND | WAENG | GL | 0x474C | UTC -04:00 |
| GERMANY | WAEDX | GM | 0x474D | UTC + 01:00 |
| GO GLORISOS ISLAND |  | GO | 0x474F | UTC + 04:00 |
| GREECE | WSEAG | GR | 0x4752 | UTC + 02:00 |
| CROATIA | WSEAS | HR | 0x4852 | UTC + 01:00 |
| HUNGARY | WSEAH | HU | 0x4855 | UTC + 01:00 |
| ICELAND | WSEAI | IC | 0x4943 | UTC + 00:00 |
| IM MAN, ISLE OF |  | IM | 0x494D | UTC + 00:00 |
| IP CLIPPERTON ISLAND |  | IP | 0x4950 | UTC -08:00 |
| ISRAEL | WSPAK | IS | 0x4953 | UTC + 02:00 |
| ITALY | WAEIX | IT | 0x4954 | UTC + 01:00 |
| JE JERSEY |  | JE | 0x4A45 | UTC + 00:00 |
| JN JAN MAYEN |  | JN | 0x4A4E | UTC + 01:00 |
| SLOVAKIA | WSEAU | LO | 0x4C4F | UTC + 01:00 |
| LS LEICHTENSTEIN |  | LS | 0x4C53 | UTC + 01:00 |
| LESOTHO | WSABF | LT | 0x4C54 | UTC + 02:00 |
| LUXEMBOURG | WSEAJ | LU | 0x4C55 | UTC + 01:00 |
| MACEDONIA | WSEAW | MK | 0x4D4B | UTC + 01:00 |
| MONACO | WAEIZ | MN | 0x4D4E | UTC + 01:00 |
| MALTA | WSEAK | MT | 0x4D54 | UTC + 01:00 |
| MONTENEGRO | WSEMA | MW | 0x4D57 | UTC + 01:00 |
| NETHERLANDS | WAENL | NL | 0x4E4C | UTC + 01:00 |
| NORWAY | WAENX | NO | 0x4E4F | UTC + 01:00 |
| POLAND | WSEAL | PL | 0x504C | UTC + 01:00 |
| PORTUGAL | WAEPX | PO | 0x504F | UTC + 00:00 |
| ROMANIA | WSEAM | RO | 0x524F | UTC + 02:00 |
| SOUTH AFRICA | WSAAT | SF | 0x5346 | UTC + 02:00 |
| SLOVENIA | WSEAR | SI | 0x5349 | UTC + 01:00 |
| SAN MARINO | WAEI2 | SM | 0x534D | UTC + 01:00 |
| SPAIN | WAEEX | SP | 0x5350 | UTC + 01:00 |
| SERBIA-MONTENEGRO | WSEAZ | SR | 0x5352 | UTC + 01:00 |
| SV SVALBARD |  | SV | 0x5356 | UTC + 01:00 |
| SWEDEN | WAESX | SW | 0x5357 | UTC + 01:00 |
| SYRIA | WSAA9 | SY | 0x5359 | UTC + 02:00 |
| SWITZERLAND | WAECH | SZ | 0x535A | UTC + 01:00 |
| UK UNITED KINGDOM |  | UK | 0x554B | UTC + 00:00 |
| VATICAN CITY | WAEIY | VT | 0x5654 | UTC + 01:00 |
| SWAZILAND | WSABG | WS | 0x5753 | UTC + 02:00 |
| BOTSWANNA | WSABC | BC | 0x4243 | UTC + 02:00 |
| BENIN | WSACJ | BN | 0x424E | UTC + 01:00 |
| BELARUS | WSPA6 | BO | 0x424F | UTC + 03:00 |
| BS BASSAS DA INDIA |  | BS | 0x4253 | UTC + 03:00 |
| BURUNDI | WSADA | BY | 0x4259 | UTC + 02:00 |
| CHAD | WSADM | CD | 0x4344 | UTC + 01:00 |
| CONGO, REPUBLIC OF | WSADH | CF | 0x4346 | UTC + 01:00 |
| CONGO, DEMOCRATIC REPUBLIC OF | WSAAZ | CG | 0x4347 | UTC + 01:00 |
| COMOROS | WSABD | CN | 0x434E | UTC + 03:00 |
| CENTRAL AFRICA REPUBLIC | WSADL | CT | 0x4354 | UTC + 01:00 |
| CAPE VERDE ISLANDS | WSAAD | CV | 0x4356 | UTC -01:00 |
| DJIBOUTI | WSADC | DJ | 0x444A | UTC + 03:00 |
| EQUATORIAL GUINEA | WSADN | EK | 0x454B | UTC + 01:00 |
| ESTONIA | WSPBA | EN | 0x454E | UTC + 02:00 |
| ERITREA | WSADP | ER | 0x4552 | UTC + 03:00 |
| ETHIOPIA | WSAAF | ET | 0x4554 | UTC + 03:00 |
| GHANA | WSACA | GH | 0x4748 | UTC + 00:00 |
| IVORY COAST | WSAAH | IV | 0x4956 | UTC + 00:00 |
| KENYA | WSAAI | KE | 0x4B45 | UTC + 03:00 |
| LATVIA | WSPBB | LG | 0x4C47 | UTC + 02:00 |
| LITHUANIA | WSPBC | LH | 0x4C48 | UTC + 02:00 |
| LIBERIA | WSACB | LI | 0x4C49 | UTC + 00:00 |
| LIBYA | WSACF | LY | 0x4C59 | UTC + 01:00 |
| MADAGASCAR | WSACC | MA | 0x4D41 | UTC + 03:00 |
| MD MALDOVA |  | MD | 0x4D44 | UTC + 02:00 |
| MAYOTTE | WSABE | MF | 0x4D46 | UTC + 03:00 |
| MONGOLIA | WSPA8 | MG | 0x4D47 | UTC + 08:00 |
| MALAWI | WSAAK | MI | 0x4D49 | UTC + 02:00 |
| MALI | WSADR | ML | 0x4D4C | UTC + 00:00 |
| MOROCCO | WSABA | MO | 0x4D4F | UTC + 00:00 |
| MAURITIUS | WSAAL | MP | 0x4D50 | UTC + 04:00 |
| MAURITANIA | WSADS | MR | 0x4D52 | UTC + 00:00 |
| MALDIVE ISLANDS | WSPBS | MV | 0x4D56 | UTC + 05:00 |
| MOZAMBIQUE | WSAAN | MZ | 0x4D5A | UTC + 02:00 |
| NIGER | WSADU | NG | 0x4E47 | UTC + 01:00 |
| NIGERIA | WSAAP | NI | 0x4E49 | UTC + 01:00 |
| GUINEA-BISSAU | WSADQ | PU | 0x5055 | UTC + 00:00 |
| RUSSIA | WSPA2 | RS | 0x5253 | UTC + 03:00 |
| RWANDA | WSADE | RW | 0x5257 | UTC + 02:00 |
| SENEGAL | WSAAS | SG | 0x5347 | UTC + 00:00 |
| ST. HELENA | WSACK | SH | 0x5348 | UTC + 00:00 |
| SIERRA LEONE | WSADG | SL | 0x534C | UTC + 00:00 |
| SOMALIA | WSACD | SO | 0x534F | UTC + 03:00 |
| TE TROMELIN ISLAND |  | TE | 0x5445 | UTC + 04:00 |
| TOGO | WSADK | TO | 0x544F | UTC + 00:00 |
| SAO TOME & PRINCIPE | WSADF | TP | 0x5450 | UTC + 00:00 |
| TUNISIA | WSAAW | TS | 0x5453 | UTC + 01:00 |
| TANZANIA | WSAAV | TZ | 0x545A | UTC + 03:00 |
| UGANDA | WSAAX | UG | 0x5547 | UTC + 03:00 |
| UKRAINE | WSPBE | UP | 0x5550 | UTC + 02:00 |
| BURKINA FASO | WSADB | UV | 0x5556 | UTC + 00:00 |
| UZBEKISTAN | WSPBJ | UZ | 0x555A | UTC + 05:00 |
| NAMIBIA | WSADT | WA | 0x5741 | UTC + 01:00 |
| WESTERN SAHARA | WSADX | WI | 0x5749 | UTC + 00:00 |
| ZAMBIA | WSAA1 | ZA | 0x5A41 | UTC + 02:00 |
| ZIMBABWE | WSAA2 | ZI | 0x5A49 | UTC + 02:00 |
| TURKEY | WSPA1 | TU | 0x5455 | UTC + 02:00 |
| BAHRAIN | WSAAA | BA | 0x4241 | UTC + 03:00 |
| EGYPT | WSAAE | EG | 0x4547 | UTC + 02:00 |
| IRAN | WSADJ | IR | 0x4952 | UTC + 03:30 |
| IZ IRAQ |  | IZ | 0x495A | UTC + 03:00 |
| JORDAN | WSAA3 | JO | 0x4A4F | UTC + 03:00 |
| KUWAIT | WSAAJ | KU | 0x4B55 | UTC + 03:00 |
| LEBANON | WSAA8 | LE | 0x4C45 | UTC + 02:00 |
| OMAN | WSAA5 | MU | 0x4D55 | UTC + 04:00 |
| QATAR | WSAAQ | QA | 0x5141 | UTC + 03:00 |
| SAUDI ARABIA | WSAA4 | SA | 0x5341 | UTC + 03:00 |
| UNITED ARAB EMIRATES | WSAAY | TC | 0x5443 | UTC + 04:00 |
| WEST BANK | WSAD1 | WE | 0x5745 | UTC + 02:00 |
| YEMEN | WSAA6 | YM | 0x594D | UTC + 03:00 |
| AFGHANISTAN | WSPBG | AF | 0x4146 | UTC + 04:30 |
| ALGERIA | WSABB | AG | 0x4147 | UTC + 01:00 |
| AZERBAIJAN | WSPBK | AJ | 0x414A | UTC + 04:00 |
| ARMENIA | WSPA7 | AM | 0x414D | UTC + 04:00 |
| ANGOLA | WSAA7 | AO | 0x414F | UTC + 01:00 |
| BANGLADESH | WSPAB | BG | 0x4247 | UTC + 06:00 |
| BHUTAN | WSPBQ | BT | 0x4254 | UTC + 06:00 |
| SRI LANKA | WSPAX | CE | 0x4345 | UTC + 05:30 |
| EU EUROPA ISLAND |  | EU | 0x4555 | UTC + 03:00 |
| GAMBIA | WSADD | GA | 0x4741 | UTC + 00:00 |
| GABON | WSACE | GB | 0x4742 | UTC + 01:00 |
| GEORGIA | WSPBF | GG | 0x4747 | UTC + 04:00 |
| GUINEA REPUBLIC | WSAAG | GV | 0x4756 | UTC + 00:00 |
| INDIA | WSPAI | IN | 0x494E | UTC + 05:30 |
| BRITISH INDIAN OCEAN | WAPAF | IO | 0x494F | UTC + 06:00 |
| KYRGYZSTAN | WSPBP | KG | 0x4B47 | UTC + 06:00 |
| KAZAKHSTAN | WSPBH | KZ | 0x4B5A | UTC + 05:00 |
| NEPAL | WSPBR | NP | 0x4E50 | UTC + 05:45 |
| PAKISTAN | WSPAP | PK | 0x504B | UTC + 05:00 |
| REUNION | WSAAR | RE | 0x5245 | UTC + 04:00 |
| SEYCHELLES | WSPAT | SE | 0x5345 | UTC + 04:00 |
| SUDAN | WSAAU | SU | 0x5355 | UTC + 03:00 |
| TAJIKISTAN | WSPBM | TI | 0x5449 | UTC + 05:00 |
| TURKMENISTAN | WSPBL | TX | 0x5458 | UTC + 05:00 |
| MYANMAR | WSPA9 | BM | 0x424D | UTC + 06:30 |
| BRUNEI | WSPAC | BX | 0x4258 | UTC + 08:00 |
| CAMBODIA | WSPCA | CB | 0x4342 | UTC + 07:00 |
| HONG KONG | WSPAH | HK | 0x484B | UTC + 08:00 |
| INDONESIA | WSPAJ | ID | 0x4944 | UTC + 09:00 |
| LAOS | WSPCC | LA | 0x4C41 | UTC + 07:00 |
| MACAU | WSPBT | MC | 0x4D43 | UTC + 08:00 |
| ALL MALAYSIA | WSP03 | MY | 0x4D59 | UTC + 08:00 |
| PHILIPPINES | WSPAR | RP | 0x5250 | UTC + 08:00 |
| SINGAPORE | WSPAU | SN | 0x534E | UTC + 08:00 |
| THAILAND | WSPAY | TH | 0x5448 | UTC + 07:00 |
| TAIWAN | WAPAD | TW | 0x5457 | UTC + 08:00 |
| VIETNAM | WSPA5 | VM | 0x564D | UTC + 07:00 |
| CHINA | WSPAD | CH | 0x4348 | UTC + 08:00 |
| PF PARCEL ISLAND |  | PF | 0x5046 | UTC + 08:00 |
| JAPAN | WSPAL | JA | 0x4A41 | UTC + 09:00 |
| SOUTH KOREA | WSPAW | KS | 0x4B53 | UTC + 09:00 |
| EAST TIMOR | WSADY | PT | 0x5054 | UTC + 09:00 |
| NORTH KOREA | WSPCH | KN | 0x4B4E | UTC + 09:00 |
| AUSTRALIA | WAPAB | AS | 0x4153 | UTC + 10:00 |
| FIJI | WSPAG | FJ | 0x464A | UTC + 12:00 |
| NEW CALEDONIA | WSPAN | NC | 0x4E43 | UTC + 11:00 |
| NE NIUE |  | NE | 0x4E45 | UTC -11:00 |
| NORFOLK ISLANDS | WSPCE | NF | 0x4E46 | UTC + 11:30 |
| VANUATU | WAPAE | NH | 0x4E48 | UTC + 11:00 |
| NAURU | WSPAM | NR | 0x4E52 | UTC + 12:00 |
| NEW ZEALAND | WAPAC | NZ | 0x4E5A | UTC + 12:00 |
| MARSHALL ISLANDS | WSPCD | RM | 0x524D | UTC + 12:00 |
| TOKELAU | WAPAL | TL | 0x544C | UTC + 13:00 |
| TONGA | WSPAZ | TN | 0x544E | UTC + 13:00 |
| TUVALU | WAPAJ | TV | 0x5456 | UTC + 12:00 |
| WALLIS & FUTUNA | WAPAK | WF | 0x5746 | UTC + 12:00 |

# Appendix A: Definitions and Acronyms

|  |  |
| --- | --- |
| Acronym name | Acronym Description |
| HEC | Hybrid Electronic Cluster (Instrument Cluster) |
| ACU | Audio Control Unit |
| PJB | Power Junction Box |
| IMS-CAN | Infotainment Medium Speed – Controller Area Network (-Bus) |
| BMS-CAN | Body Medium Speed – Controller Area Network (-Bus) |
| CEM | Central Electric Module (EuCD-name for PJB) |
| DIM | Driver Information Module |
| FRC | Free Running Clock |
| MFD | Multifunction Display |
| IPC | Instrument Panel Cluster |
| Info CAN | Infotainment System HS-Controller Area Network (-Bus) |
| PT-CAN | Powertrain HS-Controller Area Network (-Bus) |
| BCM | Body Control Module |
| GPSM | Global Positioning Satellite Module |

# Appendix B: Reference Documents

|  |  |
| --- | --- |
| Reference # | Document Title |
| 1 | Global Clock Strategy Specification |
| 2 | SHMI Clock Setting (HMI specification) |
| 3 |  |
| 4 |  |
| 5 |  |
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