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 CONFIDENTIAL

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

Table of Contents

1 Functional Definition

1.1 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.

1.1.1 Requirements

1.1.1.1 Goals

Abilitiy to act as the clock master in the vehicle

Abilitiy to act as the clock slave in the vehicle

1.1.1.2 Scenarios

1.1.1.2.1 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.

1.1.1.2.2 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).

1.1.1.2.3 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.

1.1.1.2.4 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.

1.1.1.2.5 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.

1.1.1.2.6 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.

1.1.1.2.7 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).

1.1.1.2.8 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.

1.1.1.2.9 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).

1.1.1.2.10 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.

1.1.1.2.11 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.

1.1.1.2.12 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.

1.1.1.2.13 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)

1.1.1.2.14 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.

1.1.1.2.15 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.

1.1.1.2.16 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.

1.1.1.2.17 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.

1.1.1.2.18 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.

1.1.1.2.19 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.

1.1.1.2.20 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.

1.1.1.2.21 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.

1.1.1.3 Power State Requirements

1.1.1.3.1 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.

1.1.1.3.2 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.

1.1.1.3.3 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.

1.1.1.4 HMI Requirements

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

These settings ~~will be remembered per user and~~ 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

1.1.1.4.2 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)

1.1.1.4.3 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.

1.1.1.5 References

1.1.1.5.1 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 - ~~03:00~~ 04:00

ANTIGUA & BARBUDA	WSIAA	AC	0x4143	UTC - ~~03:00~~ 04:00
ARGENTINA	WASAB	AR	0x4152	UTC - 03:00
ANGUILLA	WSIAY	AT	0x4154	UTC - ~~03:00~~ 04:00
AY ANTARCTICA		AY	0x4159	UTC ~~-03:00~~ +01:00
BARBADOS	WSIAC	BB	0x4242	UTC - ~~03:00~~ 04:00
BAHAMAS	WSIAB	BF	0x4246	UTC - ~~03:00~~ 05:00
BELIZE	WSCAB	BH	0x4248	UTC - ~~03:00~~ 06:00
BOLIVIA	WSSAC	BL	0x424C	UTC - ~~03:00~~ 04:00
SOLOMON ISLANDS	WSPAV	BP	0x4250	UTC ~~-03:00~~ +11:00
BQ NAVASSA ISLAND		BQ	0x4251	UTC - ~~03:00~~ 05:00
BRAZIL	WASAC	BR	0x4252	UTC - 03:00
BV BOUVET ISLAND		BV	0x4256	UTC ~~-03:00~~ 00:00
CHILE	WSSAE	CI	0x4349	UTC - ~~03:00~~ 04:00
CAYMAN ISLAND	WSIAT	CJ	0x434A	UTC - ~~03:00~~ 05:00
CK COCOS ISLANDS		CK	0x434B	UTC - ~~03:00~~ 06:30
COLOMBIA	WSSAF	CO	0x434F	UTC - ~~03:00~~ 05:00
NORTHERN MARIANA ISLANDS	WATAC	CQ	0x4351	UTC ~~-03:00~~ +11:00
CR CORAL SEA ISLAND		CR	0x4352	UTC ~~-03:00~~ +10:00
COSTA RICA	WSCAC	CS	0x4353	UTC - ~~03:00~~ 06:00
CUBA	WSICA	CU	0x4355	UTC - ~~03:00~~ 05:00
COOK ISLANDS	WSPCB	CW	0x4357	UTC - ~~03:00~~ 10:00
DOMINICA	WSIAE	DO	0x444F	UTC - ~~03:00~~ -04:00
DOMINICAN REPUBLIC	WSIAF	DR	0x4452	UTC - ~~03:00~~ 04:00
ECUADOR	WSSAH	EC	0x4543	UTC - ~~03:00~~ 05:00
EL SALVADOR	WSCAD	ES	0x4553	UTC - ~~03:00~~ 06:00
FRENCH GUIANA	WSSAJ	FG	0x4647	UTC - 03:00
FALKLAND ISLANDS	WSSAI	FK	0x464B	UTC - 03:00
GRENADA	WSIAG	GJ	0x474A	UTC - ~~03:00~~ 04:00
GUADELOUPE	WSIAH	GP	0x4750	UTC - ~~03:00~~ 04:00
GUATEMALA	WSCAE	GT	0x4754	UTC - ~~03:00~~ 06:00
GUYANA	WSSAK	GY	0x4759	UTC - ~~03:00~~ 04:00
HAITI	WSIAI	HA	0x4841	UTC - ~~03:00~~ 05:00
HONDURAS	WSCAF	HO	0x484F	UTC - ~~03:00~~ 06:00
JAMAICA	WSIAJ	JM	0x4A4D	UTC - ~~03:00~~ 05:00
KIRIBATI	WSPCR	KR	0x4B52	UTC ~~-03:00~~ +12:00
KT CHRISTMAS ISLAND		KT	0x4B54	UTC ~~-03:00~~ +07:00
MARTINIQUE	WSIAK	MB	0x4D42	UTC - ~~03:00~~ 04:00
MONSERRAT	WSIAU	MH	0x4D48	UTC - ~~03:00~~ 04:00
SURINAM	WSSAN	NS	0x4E53	UTC - 03:00
NETHERLANDS ANTILLES	WSIA1	NT	0x4E54	UTC - ~~03:00~~ 04:00
NICARAGUA	WSCAG	NU	0x4E55	UTC - ~~03:00~~ 06:00
PARAGUAY	WSSAL	PA	0x5041	UTC - ~~03:00~~ 04:00
PERU	WSSAM	PE	0x5045	UTC - ~~03:00~~ 05:00
PANAMA	WSCAH	PM	0x504D	UTC - ~~03:00~~ 05:00
ST. KITTS & NEVIS	WSIAL	SC	0x5343	UTC - ~~03:00~~ 04:00

ST. LUCIA	WSIAM	ST	0x5354	UTC - ~~03:00~~ 04:00
TRINIDAD & TOBAGO	WSIAR	TD	0x5444	UTC - ~~03:00~~ 04:00
URUGUAY	WSSAP	UY	0x5559	UTC - 03:00
ST. VINCENT & THE GRENADINES	WSIAN	VC	0x5643	UTC - ~~03:00~~ 04:00
VENEZUELA	WASAD	VE	0x5645	UTC - ~~03:00~~ 04:30
BRITISH VIRGIN ISLANDS	WSIAS	VI	0x5649	UTC - ~~03:00~~ 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 - ~~05:00~~ 11:00
BERMUDA	WSIAD	BD	0x4244	UTC - ~~05:00~~ 04:00
CANADA	WANAC	CA	0x4341	UTC - 05:00
DQ JARVIS ISLAND		DQ	0x4451	UTC - ~~05:00~~ 11:00
MICRONESIA	WAPAG	FM	0x464D	UTC - ~~05:00~~ +11:00
FQ BAKER ISLAND		FQ	0x4651	UTC - ~~05:00~~ 12:00
GUAM-U.S. TERR. (USE WATAB)	WANAF	GQ	0x4751	UTC ~~-~~ ~~05:00~~ +11:00
JQ JOHNSON ATOLL		JQ	0x4A51	UTC - ~~05:00~~ 10:00
KQ KINGMAN REEF		KQ	0x4B51	UTC - ~~05:00~~ 11:00
LQ PALMYRA ATOLL		LQ	0x4C51	UTC - ~~05:00~~ 11:00
MQ MIDWAY ISLAND		MQ	0x4D51	UTC - ~~05:00~~ 11:00
PALAU	WAPAH	PS	0x5053	UTC ~~-~~ ~~05:00~~ +10:00
PUERTO RICO (USE WATAE)	WANAJ	RQ	0x5251	UTC - ~~05:00~~ 04:00
SX S GEO/S SWADWIC		SX	0x5358	UTC - ~~05:00~~ 02:00
UM US MINOR OUTLYING ISLANDS		UM	0x554D	UTC ~~-~~ ~~05:00~~ +12:00
US VIRGIN ISLANDS	WATAD	VQ	0x5651	UTC - ~~05:00~~ 04:00
WQ WAKE ISLAND		WQ	0x5751	UTC - ~~05:00~~ +12:00
ALBANIA	WSEAY	AL	0x414C	UTC ~~-~~ ~~05:00~~ +01:00
TAHITI	WSIAP	FP	0x4650	UTC - ~~05:00~~ 10:00
MEXICO	WANAD	MX	0x4D58	UTC - ~~05:00~~ 06:00
PC PITCAIRN ISLAND		PC	0x5043	UTC - ~~05:00~~ 08:00
PAPUA	WSPAQ	PP	0x5050	UTC ~~-~~ ~~05:00~~ +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 + ~~01:00~~ 02:00
CYPRUS	WSPAE	CY	0x4359	UTC + ~~01:00~~ 02:00
DENMARK	WAEDK	DA	0x4441	UTC + 01:00
IRELAND	WAEIR	EI	0x4549	UTC + ~~01:00~~ 00:00
CZECH REPUBLIC	WSEAT	EZ	0x455A	UTC + 01:00

FINLAND	WAESF	FI	0x4649	UTC + ~~01:00~~ 02:00
FAEROE ISLANDS	WSEAE	FO	0x464F	UTC + ~~01:00~~ 00:00
FRANCE	WAEFX	FR	0x4652	UTC + 01:00
FRENCH SOUTH. ANTARCTIC LANDS	WSABH	FS	0x4653	UTC + ~~01:00~~ 05:00
GIBRALTAR	WSEAF	GI	0x4749	UTC + 01:00
GK GUERNSEY		GK	0x474B	UTC + ~~01:00~~ 00:00
GREENLAND	WAENG	GL	0x474C	UTC ~~+ 01:00~~ -04:00
GERMANY	WAEDX	GM	0x474D	UTC + 01:00
GO GLORISOS ISLAND		GO	0x474F	UTC + ~~01:00~~ 04:00
GREECE	WSEAG	GR	0x4752	UTC + ~~01:00~~ 02:00
CROATIA	WSEAS	HR	0x4852	UTC + 01:00
HUNGARY	WSEAH	HU	0x4855	UTC + 01:00
ICELAND	WSEAI	IC	0x4943	UTC + ~~01:00~~ 00:00
IM MAN, ISLE OF		IM	0x494D	UTC + ~~01:00~~ 00:00
IP CLIPPERTON ISLAND		IP	0x4950	UTC ~~+ 01:00~~ -08:00
ISRAEL	WSPAK	IS	0x4953	UTC + ~~01:00~~ 02:00
ITALY	WAEIX	IT	0x4954	UTC + 01:00
JE JERSEY		JE	0x4A45	UTC + ~~01:00~~ 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 + ~~01:00~~ 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 + ~~01:00~~ 00:00
ROMANIA	WSEAM	RO	0x524F	UTC + ~~01:00~~ 02:00
SOUTH AFRICA	WSAAT	SF	0x5346	UTC + ~~01:00~~ 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 + ~~01:00~~ 02:00
SWITZERLAND	WAECH	SZ	0x535A	UTC + 01:00
UK UNITED KINGDOM		UK	0x554B	UTC +~~01:00~~ 00:00
VATICAN CITY	WAEIY	VT	0x5654	UTC + 01:00
SWAZILAND	WSABG	WS	0x5753	UTC + ~~01:00~~ 02:00
BOTSWANNA	WSABC	BC	0x4243	UTC + ~~01:00~~ 02:00
BENIN	WSACJ	BN	0x424E	UTC + 01:00

BELARUS	WSPA6	BO	0x424F	UTC + ~~01:00~~ 03:00
BS BASSAS DA INDIA		BS	0x4253	UTC + ~~01:00~~ 03:00
BURUNDI	WSADA	BY	0x4259	UTC + ~~01:00~~ 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 + ~~01:00~~ 03:00
CENTRAL AFRICA REPUBLIC	WSADL	CT	0x4354	UTC + 01:00
CAPE VERDE ISLANDS	WSAAD	CV	0x4356	UTC ~~+ 01:00~~ -01:00
DJIBOUTI	WSADC	DJ	0x444A	UTC + ~~01:00~~ 03:00
EQUATORIAL GUINEA	WSADN	EK	0x454B	UTC + 01:00
ESTONIA	WSPBA	EN	0x454E	UTC + ~~01:00~~ 02:00
ERITREA	WSADP	ER	0x4552	UTC + ~~01:00~~ 03:00
ETHIOPIA	WSAAF	ET	0x4554	UTC + ~~01:00~~ 03:00
GHANA	WSACA	GH	0x4748	UTC + ~~01:00~~ 00:00
IVORY COAST	WSAAH	IV	0x4956	UTC + ~~01:00~~ 00:00
KENYA	WSAAI	KE	0x4B45	UTC + ~~01:00~~ 03:00
LATVIA	WSPBB	LG	0x4C47	UTC + ~~01:00~~ 02:00
LITHUANIA	WSPBC	LH	0x4C48	UTC + ~~01:00~~ 02:00
LIBERIA	WSACB	LI	0x4C49	UTC + ~~01:00~~ 00:00
LIBYA	WSACF	LY	0x4C59	UTC + 01:00
MADAGASCAR	WSACC	MA	0x4D41	UTC +~~01:00~~ 03:00
MD MALDOVA		MD	0x4D44	UTC + ~~01:00~~ 02:00
MAYOTTE	WSABE	MF	0x4D46	UTC + ~~01:00~~ 03:00
MONGOLIA	WSPA8	MG	0x4D47	UTC + ~~01:00~~ 08:00
MALAWI	WSAAK	MI	0x4D49	UTC + ~~01:00~~ 02:00
MALI	WSADR	ML	0x4D4C	UTC + ~~01:00~~ 00:00
MOROCCO	WSABA	MO	0x4D4F	UTC + ~~01:00~~ 00:00
MAURITIUS	WSAAL	MP	0x4D50	UTC + ~~01:00~~ 04:00
MAURITANIA	WSADS	MR	0x4D52	UTC + ~~01:00~~ 00:00
MALDIVE ISLANDS	WSPBS	MV	0x4D56	UTC + ~~01:00~~ 05:00
MOZAMBIQUE	WSAAN	MZ	0x4D5A	UTC + ~~01:00~~ 02:00
NIGER	WSADU	NG	0x4E47	UTC + 01:00
NIGERIA	WSAAP	NI	0x4E49	UTC + 01:00
GUINEA-BISSAU	WSADQ	PU	0x5055	UTC + ~~01:00~~ 00:00
RUSSIA	WSPA2	RS	0x5253	UTC + ~~01:00~~ 03:00
RWANDA	WSADE	RW	0x5257	UTC + ~~01:00~~ 02:00
SENEGAL	WSAAS	SG	0x5347	UTC + ~~01:00~~ 00:00
ST. HELENA	WSACK	SH	0x5348	UTC + ~~01:00~~ 00:00
SIERRA LEONE	WSADG	SL	0x534C	UTC + ~~01:00~~ 00:00
SOMALIA	WSACD	SO	0x534F	UTC + ~~01:00~~ 03:00
TE TROMELIN ISLAND		TE	0x5445	UTC + ~~01:00~~ 04:00
TOGO	WSADK	TO	0x544F	UTC + ~~01:00~~ 00:00
SAO TOME & PRINCIPE	WSADF	TP	0x5450	UTC + ~~01:00~~ 00:00
TUNISIA	WSAAW	TS	0x5453	UTC + 01:00

TANZANIA	WSAAV	TZ	0x545A	UTC + ~~01:00~~ 03:00
UGANDA	WSAAX	UG	0x5547	UTC + ~~01:00~~ 03:00
UKRAINE	WSPBE	UP	0x5550	UTC + ~~01:00~~ 02:00
BURKINA FASO	WSADB	UV	0x5556	UTC + ~~01:00~~ 00:00
UZBEKISTAN	WSPBJ	UZ	0x555A	UTC + ~~01:00~~ 05:00
NAMIBIA	WSADT	WA	0x5741	UTC + 01:00
WESTERN SAHARA	WSADX	WI	0x5749	UTC + ~~01:00~~ 00:00
ZAMBIA	WSAA1	ZA	0x5A41	UTC + ~~01:00~~ 02:00
ZIMBABWE	WSAA2	ZI	0x5A49	UTC + ~~01:00~~ 02:00
TURKEY	WSPA1	TU	0x5455	UTC + 02:00
BAHRAIN	WSAAA	BA	0x4241	UTC + ~~04:00~~ 03:00
EGYPT	WSAAE	EG	0x4547	UTC +~~04:00~~ 02:00
IRAN	WSADJ	IR	0x4952	UTC + ~~04:00~~ 03:30
IZ IRAQ		IZ	0x495A	UTC + ~~04:00~~ 03:00
JORDAN	WSAA3	JO	0x4A4F	UTC + ~~04:00~~ 03:00
KUWAIT	WSAAJ	KU	0x4B55	UTC + ~~04:00~~ 03:00
LEBANON	WSAA8	LE	0x4C45	UTC + ~~04:00~~ 02:00
OMAN	WSAA5	MU	0x4D55	UTC + 04:00
QATAR	WSAAQ	QA	0x5141	UTC + ~~04:00~~ 03:00
SAUDI ARABIA	WSAA4	SA	0x5341	UTC + ~~04:00~~ 03:00
UNITED ARAB EMIRATES	WSAAY	TC	0x5443	UTC + 04:00
WEST BANK	WSAD1	WE	0x5745	UTC + ~~04:00~~ 02:00
YEMEN	WSAA6	YM	0x594D	UTC + ~~04:00~~ 03:00
AFGHANISTAN	WSPBG	AF	0x4146	UTC + ~~04:00~~ 04:30
ALGERIA	WSABB	AG	0x4147	UTC + ~~04:00~~ 01:00
AZERBAIJAN	WSPBK	AJ	0x414A	UTC + 04:00
ARMENIA	WSPA7	AM	0x414D	UTC + 04:00
ANGOLA	WSAA7	AO	0x414F	UTC + ~~04:00~~ 01:00
BANGLADESH	WSPAB	BG	0x4247	UTC + ~~04:00~~ 06:00
BHUTAN	WSPBQ	BT	0x4254	UTC +~~04:00~~ 06:00
SRI LANKA	WSPAX	CE	0x4345	UTC +~~04:00~~ 05:30
EU EUROPA ISLAND		EU	0x4555	UTC +~~04:00~~ 03:00
GAMBIA	WSADD	GA	0x4741	UTC +~~04:00~~ 00:00
GABON	WSACE	GB	0x4742	UTC +~~04:00~~ 01:00
GEORGIA	WSPBF	GG	0x4747	UTC + 04:00
GUINEA REPUBLIC	WSAAG	GV	0x4756	UTC + ~~04:00~~ 00:00
INDIA	WSPAI	IN	0x494E	UTC +~~04:00~~ 05:30
BRITISH INDIAN OCEAN	WAPAF	IO	0x494F	UTC +~~04:00~~ 06:00
KYRGYZSTAN	WSPBP	KG	0x4B47	UTC +~~04:00~~ 06:00
KAZAKHSTAN	WSPBH	KZ	0x4B5A	UTC +~~04:00~~ 05:00
NEPAL	WSPBR	NP	0x4E50	UTC +~~04:00~~ 05:45
PAKISTAN	WSPAP	PK	0x504B	UTC +~~04:00~~ 05:00
REUNION	WSAAR	RE	0x5245	UTC + 04:00
SEYCHELLES	WSPAT	SE	0x5345	UTC + 04:00
SUDAN	WSAAU	SU	0x5355	UTC +~~04:00~~ 03:00
TAJIKISTAN	WSPBM	TI	0x5449	UTC +~~04:00~~ 05:00
TURKMENISTAN	WSPBL	TX	0x5458	UTC + ~~04:00~~ 05:00

MYANMAR	WSPA9	BM	0x424D	UTC + ~~08:00~~ 06:30
BRUNEI	WSPAC	BX	0x4258	UTC + 08:00
CAMBODIA	WSPCA	CB	0x4342	UTC + ~~08:00~~ 07:00
HONG KONG	WSPAH	HK	0x484B	UTC + 08:00
INDONESIA	WSPAJ	ID	0x4944	UTC + ~~08:00~~ 09:00
LAOS	WSPCC	LA	0x4C41	UTC + ~~08:00~~ 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 + ~~08:00~~ 07:00
TAIWAN	WAPAD	TW	0x5457	UTC + 08:00
VIETNAM	WSPA5	VM	0x564D	UTC + ~~08:00~~ 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 + ~~12:00~~ 11:00
NE NIUE		NE	0x4E45	UTC ~~+ 12:00~~ -11:00
NORFOLK ISLANDS	WSPCE	NF	0x4E46	UTC + ~~12:00~~ 11:30
VANUATU	WAPAE	NH	0x4E48	UTC + ~~12:00~~ 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 + ~~12:00~~ 13:00
TONGA	WSPAZ	TN	0x544E	UTC + ~~12:00~~ 13:00
TUVALU	WAPAJ	TV	0x5456	UTC + 12:00
WALLIS & FUTUNA	WAPAK	WF	0x5746	UTC + 12:00

2 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

3 Appendix B: Reference Documents

Reference #	Document Title
1	Global Clock Strategy Specification
2	SHMI Clock Setting (HMI specification)
3	
4	
5	
6	
7	
8	
9	
10	
11	