CAN PARAMETER SPECIFICTIONS FOR TELEMATICS

TABLE OF CONTENTS

TABLES

REVISION SHEET

Revision	Date	Description	Remarks	Prepared	Checked
1.0	05-09-15	CAN Specification for EDC Models	Initial draft	R S Ayyappan	J Lakshminarasimhan
2.0	23-09-15	CAN Specification for EEA Models added Revised CAN Specification for EDC Models – Update rate, source ECU etc… added DM1 processing added		R S Ayyappan	J Lakshminarasimhan
2.1	20-04-16	GSAS Compliance factor revised from 1 to 0.1 GSAS Compliance is included in EDC Models as some EDC models support the message		R S Ayyappan	J Lakshminarasimhan
2.2	06-05-16	Units added		R S Ayyappan	J Lakshminarasimhan
2.3	21-05-18	Reference Document Deleted Applicability section updated as CAN data acquisition scope Source address section added. Diagnostics message processing section updated EDC Matrix Updated EEA Matrix Updated General annotations updated	Unified packet structure definition	R S Ayyappan	Vignesh T A
2.4	13-06-18	EDC Matrix Updated (New SPNs added)	Internal customer requirement	R S Ayyappan	Vignesh T A
2.5	25-06-18	EV CAN Matrix added	Internal customer requirement	R S Ayyappan	Vignesh T A

1. PURPOSE

The purpose of the document is to capture CAN Matrix specification of different vehicle types for Telematics based data capture as part of Ashok Leyland OE Telematics solution. The specifications help in extracting and interpreting CAN messages in the Telematics on-board unit / backend server to generate periodic data packets are alerts/events.

2. CAN DATA AQUISTION SCOPE

Table 1: CAN Data Acquisition Scope

Sl No	Vehicle Types	CAN Baud Rate	Remarks
1	IL	NA	Mechanical vehicle, where CAN matrix is not applicable
2	EDC	250 kbps	CAN Matrix A
3	EEA	250 kbps	CAN Matrix B
4	CNG	250 kbps	CAN Matrix A + Delta X
5	BS6 EDC	500 Kbps	CAN Matrix A + Delta Y
6	BS6 EEA	500 Kbps	CAN Matrix C
7	EV	250 kbps	CAN Matrix B + Delta Z
8	OBDII	250/500 kbps / other	OBDII PIDs

3. GENERAL ANNOTATIONS

- CAN data is not available during ignition off / main switch off.
- Most of the values are reliable after 5 seconds after “ignition on”.
- CAN application layer is according SAE J1939/ 71
- The CAN messages shall be read / processed and transmitted to AL even if the value is out of the range. The range validation of parameters shall be done in application level where the value is used for display or for other computations.

4. ECU SOURCE ADDRESS - CAN

Table 2: ECU Source IDs

Sl No	ECU	Source Address (integer)	Remarks
1	Engine ECU	0	Engine ECU
2	SCR	61	SCR ECU
3	ABS	11	ABS ECU
4	BCU	33	Body Controller for Truck
5	Cluster	23	EEA Electronic Cluster
6	MUX	229	Multiplexer
7	AT/AMT	3	Automatic Transmission or Automatic Manual Transmission
8	EVCU	239	Electric Vehicle Control Unit

5. DIAGNOSTICS MESSAGE (DM1) PROCESSING

- DM1 messages shall trigger alerts to backend.
- DM1 single packet and multipack messages shall be parsed as per standard J1939 and alerts shall be triggered for every SPN-FMI combined number.
- Source ECU ID, Error Code (SPN - FMI) combined number, Occurrence count and Warning Lamp status shall be extracted from DM1 messages and alert messages shall be formed.
- There shall be no duplicate alert for same Source ECU ID, Error Code (SPN - FMI) combined number and Occurrence count in the same Ignition cycle (DM1 messages are send from ECU @ 1 Hz when an error is active).
- At every Ignition ON, all available DM1s shall be processed and alerts shall be send from Telematics gateway to back office.
- If the DM1 stops arriving from an ECU for more than 1 minutes or the occurrence count increments during the same ignition cycle, then the alert shall be closed (Event message)

6. CAN SPECIFICATION FOR EDC MODELS

Table 3: CAN Specification for EDC Models

S.I No	Parameter	Source ECU	STD PGN	Update Rate (msec)	STARTING BIT	LENGTH	FACTOR	OFFSET	OPERATING RANGE	Unit	Remarks
1	Accelerator Pedal Position 1	Engine	61443	20	2.1	8	0.4	0	0/100	%	
2	Engine Speed	Engine	61444	10	4.1	16	0.125	0	0/8031.875	rpm	
3	Actual Engine - Percent Torque	Engine	61444	10	3.1	8	1	-125	-125 to 125	%	Effective Torque = Actual engine percent torque - Frictional torque
4	Drivers Demand Engine percent Torque	Engine	61444	10	2.1	8	1	-125	-125 to 125	%	
5	Nominal Friction - Percent Torque	Engine	65247	250	1.1	8	1	-125	-125 to 125	%	
6	Total Vehicle Distance	Engine	65248	1000	4.1	32	0.125	0	0 to 526,385,151.9	Km	
7	Total Engine Hours of Operation	Engine	65253	On reqest	1.1	32	0.05	0	0/210554060.75	hr	On request from Engine ECU
8	Engine Total Fuel Used	Engine	65257	On reqest	5.1	32	0.5	0	0/2105540607.5	L	On request from Engine ECU
9	Engine Oil Temperature 1	Engine	65262	1000	3.1	16	0.03125	-273	-273 to 1735	deg C	
10	Engine Coolant Temperature	Engine	65262	1000	1.1	8	1	-40	- 40/210	deg C	
11	Engine Fuel Temperature 1	Engine	65262	1000	2.1	8	1	-40	-40 to 210	deg C	
12	Engine Oil Pressure	Engine	65263	500	4.1	8	4	0	0/1000	kPa	
13	Wheel-Based Vehicle Speed	Engine	65265	20	2.1	16	1/256	0	0/250.996	Km/h	
14	Brake Switch	Engine	65265	100	4.5	2	1	0	0-3	State	00-released; 01-Pressed; 10-Switch Failure; 11-Reserved
15	Clutch Switch	Engine	65265	100	4.7	2	1	0	0-3	State	00-released; 01-Pressed; 10-Switch Failure; 11-

											Reserved
16	Barometric Pressure	Engine	65269	1000	1.1	8	0.5	0	0 to 125	kPa	
17	Ambient air temperature	Engine	65269	1000	4.1	16	0.03125	-273	-273 to 1735	deg C	
18	Engine Intake Manifold #1 Pressure	Engine	65270	500	2.1	8	2	0	0 to 500	deg C	
19	Engine Intake manifold 1 temperature	Engine	65270	500	3.1	8	1	-40	-40 to 210	deg C	
20	Engine air inlet pressure	Engine	65270	500	4.1	8	2	0	0 to 500	kPa	
21	GSAS Compliance	Cluster	65297	1000	1.1	16	0.1	0	0 to 100	%	

- Request message from Telematics unit to be enabled for obtaining Engine hours and Fuel Consumption from Engine ECU.
- The request interval shall be equal to 30 sec.

7. CAN SPECIFICATION FOR EEA MODELS

Table 4: CAN Specification for EEA Models

SL NO	PARAMETER NAME	SOURCE ECU	PGN	UPDATE RATE	STARTING BIT	LENGTH	FACTOR	OFFSET	OPERATING RANGE	UNIT OF MEASURE	REMARKS
1	Wheel-Based Vehicle Speed	BCU	65280	20	1.1	16	1/256	0	0 to 250.996	km/h	
2	Engine Speed	BCU	65280	20	3.1	16	0.125	0	0 to 8031.875	rpm	
3	Total Engine Hours of Operation	BCU	65280	20	5.1	32	0.05	0	0 to 210554060.75	hr/bit	
4	Engine Oil Pressure	BCU	65281	500	1.1	8	4	0	0 to 1000	kPa	
5	Engine Coolant temperature	BCU	65281	500	2.1	8	1	-40	-40 to 210	deg C	
6	Engine Total Fuel Used	BCU	65281	500	3.1	32	0.5	0	0 to 2105540607.5	L/bit	
7	Vehicle Odometer	BCU	65283	100	1.1	32	0.125	0	0 to 526,385,151.9	Km/bit	
8	Accelerator Pedal Position 1	BCU	65287	20	1.1	8	0.4	0	0 to 100	%/bit	

9	Actual engine - percent torque	BCU	65287	20	2.1	8	1	-125	-125 to 125	%/bit	
10	Nominal Friction - Percent Torque	BCU	65287	20	3.1	8	1	-125	-125 to 125	%/bit	
11	Clutch Switch	BCU	65287	20	6.1	2	1	0	4 states/2 bit	4 states/2 bit	00 - Clutch pedal released 01 - Clutch pedal depressed 10 - Switch Failure Error 11 - Clutch Riding
12	Brake Switch	BCU	65287	20	6.3	2	1	0	4 states/2 bit	4 states/2 bit	00-released; 01-Pressed; 10-Switch Failure; 11- Reserved
13	Battery Charging Current	BCU	65287	20	7.1	16	0.004	-100	-100 to 100	Amps	Available in bus models only
14	Air pressure 1	BCU	65288	100	1.1	8	8	0	0 to 2,000	Kpa/bit	
15	Air pressure 2	BCU	65288	100	2.1	8	8	0	0 to 2,000	Kpa/bit	
16	Fuel Level	BCU	65289	100	1.1	16	0.25	0	0 to 9999	L	
17	Distance to Empty	BCU	65289	100	3.1	16	1	0	0 to 9999	Km	
18	GSAS Compliance	Cluster	65297	1000	1.1	16	0.1	0	0 to 100	0.1 % per bit	
19	~~Vehicle Battery Potential~~	BCU	-	-	-	-	-	-	-	-	Not applicable
20	~~GSAS Mode Switch~~	BCU	-	-	-	-	-	-	-	-	Not applicable
21	~~Trip 1 fuel economy~~	BCU	-	-	-	-	-	-	-	-	Not applicable
22	~~Trip 2 fuel economy~~	BCU	-	-	-	-	-	-	-	-	Not applicable
23	~~Trip distance 1~~	BCU	-	-	-	-	-	-	-	-	Not applicable
24	~~Trip distance 2~~	BCU	-	-	-	-	-	-	-	-	Not applicable
25	Parking brake	BCU	65290	20	4.7	2	1	0	4 states/2 bit	4 states/2 bit	00: Off, 01: ON, 10: park Brake Switch failure, 11: Reserved

26	Trailer indicator	BCU	65290	20	6.1	2	1	0	4 states/2 bit	4 states/2 bit	00: Off, 01: ON, 10: Trailer Indicator Switch failure, 11: Reserved
27	PTO position	BCU	65290	20	8.1	3	1	0	4 states/2 bit	8 states/3 bit	00: Off, 01: ON, 110: PTO Switch failure, 11: Reserved

8. CAN SPECIFICATION FOR BS6 EDC MODELS

To be included

9. CAN SPECIFICATION FOR BS6 EEA MODELS

To be included

10. CAN SPECIFICATION FOR EV MODELS

SL NO	PARAMETER NAME	SOURCE ECU	PGN	UPDATE RATE	STARTING BIT	LENGTH	FACTOR	OFFSET	OPERATING RANGE	UNIT OF MEASURE	REMARKS
1	Wheel-Based Vehicle Speed	BCU	65280	20	1.1	16	1/256	0	0 to 250.996	km/h	
2	Vehicle Odometer	BCU	65283	100	1.1	32	0.125	0	0 to 526,385,151.9	Km/bit	
3	Air pressure 1	BCU	65288	100	1.1	8	8	0	0 to 2,000	Kpa/bit	
4	Air pressure 2	BCU	65288	100	2.1	8	8	0	0 to 2,000	Kpa/bit	
5	SOC Gauge	EVCU	65376	200	1.1	8	0.4	0	0-100%	%	% state of charge of HV battery
6	Chiller Temperature	EVCU	65376	200	2.1	8	0.5	-10	-10 to 60 degC	degC	Coolant temp in DegC
7	Main Coolant Temperature	EVCU	65376	200	5.1	8	0.5	0	0-100 degC		Coolant temp in DegC
8	Park Current	EVCU	65376	200	6.1	16	1	0	(-5000 to 500A)		" Batatrey Current": Value
10	Pack Voltage	EVCU	65378	200	5.1	16	1	0	(0- 700V)	V	
11	Battery Status	EVCU	65379	200	1.1	4	1	0			0-"BATTERY INITIALIZING" 1-"BATTERY EMERGENCY OFF" 2- " BATTERY IN WAKE UP" 3-" BATTERY IN SLEEP MODE" 4-" BATTERY HV ACTIVE" 5-"BATTERY OPERATION READY" 6-"BATTERY MAINTANENCE MODE 1" 7-"BATTERY MAINTANENCE MODE 2" 8-"BATTERY MAINTANENCE MODE 3"

12	Vehicle Transmission Mode	EVCU	65379	200	1.5	2	1	0			0- "N" 1- "R" 2- "D1" 3- "D2"
13	Charger Status	EVCU	65379	200	1.7	2	1	0			0- "CHARGER OFF" 1-"CHARGER ACTIVE" 2 -"CHARGER FAULT"
14	Isolation status	EVCU	65379	200	2.1	2	1	0			0- "NO ISOLATION FAULT" 1- "ISOLATION FAULT DETECTED"
15	Auxliaries Status	EVCU	65379	200	2.3	3	1	0			0-"AUXILLIARIES OFF" 1- "AUX1 ACTIVE" 2 -"AUX2 ACTIVE" 3-"AUX1 AND AUX2 ACTIVE" 4- "AUX1 FAULT" 5 -"AUX2 FAULT" 6- "AUX1 AND AUX2 FAULT"
16	DCDC Conveter Status	EVCU	65379	200	2.6	0	1	0			0-"DC-DC CONVERTERS OFF" 1- "DC-DC CON1 ACTIVE" 2 -"DC-DC CON2 ACTIVE" 3-"DC-DC CON1 AND DCDC CON2 ACTIVE" 4- "DC-DC CON1 FAULT" 5 -"DC-DC CON2 FAULT" 6- "DC-DC CON1 AND DC-DC CON2 FAULT"

17	Distance to Empty	EVCU	65379	200	3.1	16	1		0-200		" **Distance to empty : value (unit)**"
18	Time left for full charge (hr)	EVCU	65379	200	5.1	8	1	1	0-12		" **Time for full charge : value (unit): value (unit)** "
19	Time left for full charge(min)	EVCU	65379	200	6.1	8	1	1	0-60		
20	Motor Temperature	EVCU	65379	200	7.1	8	1	-40	50-90		Maximum motor Temeprature in : value(unit)
21	Max inlet temperature battery	EVCU	65379	200	8.1	8	1	-30	50 to 90		Maximum Temeprature in Battery: value(unit)
23	SG_ FaultCode _aux1	EVCU	65380	200	2.1	16	1	0	NA		
24	SG_ FaultCode _aux2	EVCU	65380	200	4.1	16	1	0	NA		
26	Motor Speed (MCU)	EVCU	65381	200	1.1	16	1	0	(-16384 to 16384)	rpm	
27	Motor Torque (MCU)	EVCU	65381	200	3.1	16	0.2	0	(-6425.6 to 6425.6)	Nm	
28	Motor voltage (MCU)	EVCU	65381	200	5.1	16	0.1	0	(-3212.8 to 3212.8)	V	
29	Motor current (MCU)	EVCU	65381	200	7.1	16	0.1	0	(-3212.8 to 3212.8)	A	
30	Throttle Position	EVCU	65382	200	1.1	8	1	0	0-100	%	
31	Brake Pedal	EVCU	65382	200	2.1	8	0.05	0	0-30	V	
32	Total Aux Input current	EVCU	65382	200	3.1	16	1	0		A	
33	Total DC-DC o/p current	EVCU	65382	200	5.1	16	0.05	0		A	
34	Regen %	EVCU	65382	200	7.1	8	1	0	0-100	%	
35	Total energy consumption (kWh)	EVCU	65382	200	8.1	8	0.8	0	0-300	kWh	
36	SG_VCVCCU_Inlet_MaxCurrent	EVCU	65383	200	1.1	8	1	0	0-63	A	
37	VCVCCU_V2G_EVSEPresentVolt	EVCU	65383	200	2.1	16	1	0		V	

	age_Value										
38	Energy regenerated (kWh)	EVCU	65383	200	4.1	16	1	0	0 to 65535	kWh	
39	Energy for propulsion (kWh)	EVCU	65383	200	6.1	16	1	0	1 to 65535	kWh	
40	SG_VCVCCU_PlugPresent_Resistance	EVCU	65383	200	8.1	3	1	0			
41	VCVCCU_ChargerUnitMode	EVCU	65383	200	8.4	3	1	0			
42	SG_VCVCCU_ControlPilot_Wake up	EVCU	65383	200	8.7	2	1	0			
43	Act1VOut_A	EVCU	65384	200	1.1	16	0.1	0	0-700	V	
44	Act1VOut_B	EVCU	65384	200	3.1	16	0.1	0	0-700	V	
45	Act1VOut_C	EVCU	65384	200	5.1	16	0.1	0	0-700	V	
46	Act1VOut_D	EVCU	65384	200	7.1	16	0.1	0	0-700	V	
9	Fault Status 1	EVCU	65378	200	1.1	32	1	0	NA	NA	2 bit fault list
22	Fault Status 2	EVCU	65380	200	1.1	8	1	0	NA		1 bit fault list
25	Fault Status 3	EVCU	65380	200	6.1	24	1	0	NA		1 bit fault list
47	Fault Status 4	EVCU	65385	200	1.1	32	1	0	NA		1 byte faults
48	Fault Status 5	EVCU	65385	200	5.1	32	1	0	NA		1 bit fault list
49	Fault Status 6	EVCU	65392	200	1.1	32	1	0	NA		Reserved
50	Fault Status 7	EVCU	65392	200	5.1	32	1	0	NA		Reserved

11. CAN SPECIFICATION FOR CNG MODELS

To be included

--- END OF THE DOCUMENT ---