

DAB

Delay Attribution Board

Incident Resolution Guide

ETCS and ATO Faults and Failures

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1) Introduction

UK deployments of ETCS Level 2 are set to expand from 2018 to include the new Thameslink deployment, alongside the existing deployment on Cambrian.

ETCS failure modes within this document have been determined through analysis of historic faults and failure data from the Cambrian trials, and cross-checked against the planned operational modes for Thameslink operation.

Thameslink also introduces Automatic Train Operation to UK heavy rail for the first time, and ATO failure modes have been extrapolated from the planned operational mode for the Thameslink operations.

2) Purpose

The purpose of this guide is to assist Industry Delay Resolution staff in gaining an accurate understanding of the cause of reported ETCS and ATO faults and failures that lead to delays and cancellations associated with operating using those operational systems.

This guide supplements, but is not incorporated into, the Delay Attribution Principles and Rules (DAPR).

3) Scope

This document is applicable to the reporting and recording of faults and operational failures of the ETCS or ATO systems. For any GSM-R related issues please refer to the GSM-R IRG. This IRG provides supplementary guidance to that provided in Section G3 of the DAPR.

4) Process

This document will be continually reviewed and updated as new failure modes are identified through live operation or are identified through new or amended system capabilities.

All such circumstances, as and when identified, should be advised to the Delay Attribution Board for review, consideration and inclusion in subsequent versions of this document.

Input from train operators' fleet and/or operations staff and Network Rail's maintainers and operations staff may be required to conclude the cause of individual incidents raised in TRUST or CCIL. To support this, Driver reports / TRUST reports will need to be sufficiently detailed to enable further investigation to take place and conclusions made as to cause.

This guide contains various tables to assist in identifying the cause of failures and allocating the correct delay cause code:-

- 1) The 'Scenario' column covers the various overarching events that may occur in relation to ETCS / ATO operation. These scenarios should be used as the first point of investigation.
- 2) The 'Signaller Incident Report' column sets out the what the Signaller / Controller is likely to report as an 'Event' and which is required to be reported to aid further investigations

- 3) The 'Driver Incident Report' column sets out what the Driver is likely to report as a 'Symptom' and which is required to be reported to aid further investigations
- 4) The 'Specific Information to Aid Diagnosis' column, for ETCS tables only, sets out the specific information required to aid diagnosis and identification of the cause of the fault or failure
- 5) The 'Other Relevant Information' column provides further sources of information that may be useful in aiding the diagnosis and identification of cause.
- 6) The 'Primary Cause' sets out the possible Prime Causes for the fault or failure as manifested.
- 7) The 'Attribution Principles' sets out the basic rationale for responsibility for those Prime Causes.
- 8) 'DAPR Coding' sets out the relevant DAPR Delay Code to be utilised for the Prime Cause of the fault or failure identified.
- 9) The 'Responsibility' sets out the Industry party that is deemed responsible for that Prime Cause of the fault or failure identified.
- 10) The 'IRG Code' is used for referencing any specific entry in this IRG and should be recorded in the incident text.

5) ETCS Scenario Tables

ETCS TABLE 1

Scenario	Signaller Incident Report	Driver Incident Report	Specific Information to Aid Diagnosis	Other Relevant Information <i>(not necessarily available at time of incident)</i>	Primary Cause	Attribution Principles	DAPR Coding	Responsibility	IRG Code
Train Passed End of Authority (EoA) & comes to a stand in Supervised Location.	Train passed EoA. "SPAD" alarm. MA revoked.	Unexpected (emergency) brake application. Train transitioned to TR mode. Train loses MA. EoA / MA altered (shortened).	State of network at time of incident (any other incidents / events which could have had a contributing effect). Train in SR mode prior to trip.	RBC & JRU / OTMR downloads. DRACAS investigation. SPaD investigation. Details of the Written Order.	Signaller altered the MA.	Attribution as per Cat. B / C SPaDs	OF	NR	E1.01
		Unexpected (emergency) brake application. Train transitioned to TR mode. Train loses MA. Wheel slip / slide experienced. Abnormal / unexpected equipment behaviour (odometry / speedometer). Sandbox warning (this is rolling stock specific).	Known low adhesion sites. Railhead treatment prior to incident.		System altered the MA (route protection).	Attribution as per Cat. B / C SPaDs	JR	NR	E1.02
Train Stops Short of End of Authority (EoA) Unexpectedly.	Train stopped short of EoA. Signaller shortened MA.	Unexpected (emergency) brake application. Train transitioned to TR mode. Train loses MA. "[name of NTC] brake demand" message on DMI.	At a location where ETCS level transitions from NTC to 0,1,2,3. Train in mode SN prior to trip event. National trip procedure is active.	RBC & JRU / OTMR downloads. DRACAS investigation. State of network at time of incident (any other incidents / events which could have had a contributing effect). Details of the Written Order.	Incorrect data in RBC.	Infrastructure software/erroneous data issue	JR	NR	E1.03
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		Driver error.	Attribution as per Cat. A SPaDs	FI / TS	TOC / FOC	E1.04
Balise Read Error.	MA shortened or revoked. Signaller informed of train status.	Unexpected (emergency or service) brake application: * emergency brake application and train transitioned to TR mode & loses MA; or * service brake application & MA shortened to current position. (Depends on operations and system set-up.) "Balise read error" message on DMI. May possibly get odometry error (due to lack of correction from non-read balise group).	Two balise groups not read.	RBC & JRU / OTMR downloads. DRACAS investigation.	Delayed movement - system timed out before move could be completed (e.g. "End of Authority override - passing a Stop in SR balise in SR mode - has a time limit")	Cause of delayed movement (new primary incident)	As per DAPR	TOC/FOC/NR	E1.05
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		System altered the MA	Attribute to event that caused the MA to be altered	Causal Event	TOC / FOC / NR	E2.01
Loss of GSM-R Data Connection.	Train stops at, or short of, EoA.	Unexpected brake application: * emergency brake application and train transitioned to TR mode & loses MA; or * service brake application & MA shortened to current position. (Depends on operations and system set-up.) "Communication error" message on DMI.	Any known location coverage issues. Any known location interference issues. Any planned GSM-R outages. T&V national value in RBC.	RBC & JRU / OTMR downloads. Telecoms Engineering Centre investigation. DRACAS investigation.	Signaller altered the MA	Attribute to event that caused the MA to be altered	Causal Event	TOC / FOC / NR	E2.02
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		System fault	System fault	JR	NR	E2.04
Failure of Safety Related ETCS Equipment (on train).	Failure alarm. Change to train list.	Unexpected brake application. Train transitioned to SF mode. Equipment failure message on DMI (Odometry failure alarm, BTM failure alarm etc.) - n.b. these will be supplier specific. DMI blank / frozen (sometimes, not always).	Any known equipment glitches. Mode transition from JRU (especially if the DMI goes blank / freezes).	RBC & JRU / OTMR downloads. DRACAS investigation.	Train fault	Train fault	M2	TOC / FOC	E2.05
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		Driver error	Driver error	FI / TS	TOC / FOC	E2.06
Balise Read Error.	MA shortened or revoked. Signaller informed of train status.	Unexpected (emergency or service) brake application: * emergency brake application and train transitioned to TR mode & loses MA; or * service brake application & MA shortened to current position. (Depends on operations and system set-up.) "Balise read error" message on DMI. May possibly get odometry error (due to lack of correction from non-read balise group).	Two balise groups not read.	RBC & JRU / OTMR downloads. DRACAS investigation.	RBC programmed with wrong information (could be cause of either full service or emergency brake application).	Software fault	JR	NR	E3.01
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		Balise fault	Balise fault	IM	NR	E3.02
Loss of GSM-R Data Connection.	Train stops at, or short of, EoA.	Unexpected brake application: * emergency brake application and train transitioned to TR mode & loses MA; or * service brake application & MA shortened to current position. (Depends on operations and system set-up.) "Communication error" message on DMI.	Any known location coverage issues. Any known location interference issues. Any planned GSM-R outages. T&V national value in RBC.	RBC & JRU / OTMR downloads. Telecoms Engineering Centre investigation. DRACAS investigation.	Balises not read	Train fault	M2	TOC / FOC	E3.03
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		Communications issue: * Loss of coverage. * Message transmission delay. * Lineside GSM-R / FTN equipment fault. * GSM-R turned off.	GSM-R IRG	JO	NR	E4.01
Failure of Safety Related ETCS Equipment (on train).	Failure alarm. Change to train list.	Unexpected brake application. Train transitioned to SF mode. Equipment failure message on DMI (Odometry failure alarm, BTM failure alarm etc.) - n.b. these will be supplier specific. DMI blank / frozen (sometimes, not always).	Any known equipment glitches. Mode transition from JRU (especially if the DMI goes blank / freezes).	RBC & JRU / OTMR downloads. DRACAS investigation.	On-board GSM-R equipment fault.		M0	TOC / FOC	E4.02
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		GSM-R interference beyond the extent that can be accommodated by radios compliant to the latest version of ETSI TS 102 933-1-2		JO	NR	E4.03
Failure of Safety Related ETCS Equipment (on train).	Failure alarm. Change to train list.	Unexpected brake application. Train transitioned to SF mode. Equipment failure message on DMI (Odometry failure alarm, BTM failure alarm etc.) - n.b. these will be supplier specific. DMI blank / frozen (sometimes, not always).	Any known equipment glitches. Mode transition from JRU (especially if the DMI goes blank / freezes).	RBC & JRU / OTMR downloads. DRACAS investigation.	GSM-R interference within the levels that can be accommodated by radios compliant to the latest version of ETSI TS 102 933-1-2	Commercial Discussions ongoing as to fitment of radios	-	NR / TOC / FOC	E4.04
		Unexpected (emergency) brake application. Train transitioned to TR mode. Prior to trip, driver selected shunt mode. "SH refused" message on DMI.	ETCS Level NTC area. Train in mode SN prior to trip event. National trip procedure is active.		ETCS equipment failure. Common issues from Cambrian include: * BTM Failure (equipment). * DMI fault (equipment). * TIU failure (equipment). * SoM Process Error (process). * Unexpected Transition to SB Mode (equipment). * Odometry Failure (equipment). * Quick Power On/Off (process). * Power Supply Problems (equipment - integration with legacy systems). * Earthing Fault (equipment - integration with legacy systems). * EVC fault (equipment). * No Fault Found / Can't Replicate Fault / Transient Fault / No Further Information (unknown).	Train fault/NFF guidance	M2 / M9	TOC / FOC	E5.01

ETCS TABLE 2

Scenario	Signaller Incident Report	Driver Incident Report	Specific Information to Aid Diagnosis	Other Relevant Information <i>(not necessarily available at time of incident)</i>	Primary Cause	Attribution Principles	DAPR Coding	Responsibility	IRG Code		
ETCS Found Isolated.	Driver cannot start as ETCS Isolated.	ETCS isolated. Inability to set up cab & go through SoM process.			Failure to follow process for managing units with isolated safety equipment.	Operator error	FI / TS	TOC / FOC	E6.01		
Unknown Incompatibility between line-side & on-board system versions.	MA revoked.	Unexpected brake application. Train transitioned to TR mode. Train loses MA. "Trackside not compatible" message on DMI.	Line-side system version fitted. On-board system version fitted. (If on-board system version is lower than line-side system version it causes this problem).	Line-side version. On-board version. Fleet diagram.	Wrong route set by signaller.	No opportunity for driver to challenge wrong route.	OF	NR	E7.01		
					Wrong stock allocated to diagram (train presented with onboard not upgraded)	As per DAPR for stock diagram errors -performance issues from not upgrading	MS / TA	TOC / FOC	E7.02		
					Error in project planning for upgrades / system design.	Network change error/omission/failure to notify operators or uncommunicated supplier fixes resulting in the above.	IM	NR	E7.03		
Emergency Stop Order Received.	Emergency stop order sent. MA revoked.	Unexpected brake application. Train transitioned to TR mode. Train loses MA. "Emergency stop" message on DMI.	Other faults on the network causing the system to self protect. Specific RBC data related criterion has been met resulting in an emergency stop order being generated by the system .	RBC download. DRACAS investigation.	Signaller protecting route.	Attribute to event that caused the MA to be altered	Causal Event	NR / TOC / FOC	E8.01		
	System protecting route.				Causal Event		NR / TOC / FOC	E8.02			
	MA revoked.				RBC error.	System fault	JR	NR	E8.03		
Stop Order Received.	MA revoked.	Unexpected brake application. Train transitioned to TR mode. Train loses MA. "SH stop order" message on DMI OR "SR stop order" message on DMI.	Train in SH or SR mode prior to trip. Detail of balise list which was sent (balises on list and recipient train). Detail of balise layout at the affected location. Information in balises is correct.	RBC & JRU / OTMR downloads. DRACAS investigation.	Driver error (didn't press 'over ride').		FI/TS	TOC / FOC	E9.01		
	MA revoked. Balise list sent (or not).				Error with balise list: * wrong information. * sent to wrong train	System fault	IM	NR	E9.02		
Failure to Complete ETCS Level Transition	MA not extended (depending on application).	Failure to transition ETCS level. Failure message on DMI. Unexpected brake application (depending upon operation). Train may or may not receive MA into L2 area (depending upon operation).	Level transition areas. Location of train at time of incident. Know coverage issue hotspots. Issue on approach to overlay or no signals area.	RBC & JRU / OTMR downloads. DRACAS investigation.	Line-side GSM-R / FTN equipment fault. Balise failure. RBC failure.	System/Infrastructure/Software fault	IM	NR	E10.01		
					On-board ETCS equipment fault: * Balise not read. * GSM-R equipment fault.	Train fault	M2	TOC / FOC	E10.02		
Failure to Connect to RBC / RBC connection lost	Visual indication that train is not communicating	Driver cannot connect to RBC upon start of mission. DMI may display lost connection icon.			Lineside GSM-R / FTN equipment fault RBC failure.	System/Infrastructure/Software fault	JR	NR	E11.01		
					On-board GSM-R equipment fault. Driver error.	Train fault/Driver error	M0 / TS / FI	TOC / FOC	E11.02		
					Communication failure (loss of coverage). RBC failure. Power supply failure / blip.	Refer to relevant section of the DAPR / GSM-R IRG	As per DAPR / GSM-R IRG	NR	E11.03		
		Train fails to connect to RBC. DMI may display lost connection icon.		SIM card configuration details & allocation to train / NR GSM-R network configuration		RBC & JRU / OTMR downloads. Telecoms Engineering Centre investigation. DRACAS investigation.	Base ETCS SIM card configuration is incorrect	ETCS SIM card configuration specifier (usually NR)		NR	E11.04
							ETCS SIM card failed / missing / incorrectly installed (but base SIM card configuration is known to be correct / has previously operated; and SIM card is enabled on the NR GSM-R network)	ETCS SIM failed on-train / lost / improperly installed	M0	TOC / FOC	E11.05
							ETCS SIM card swapped out owing to vehicle maintenance, and was correctly notified to Network Rail within agreed timescales, but not actioned by NR.	NR failure to follow agreed process	JR	NR	E11.06
							ETCS SIM card swapped out owing to vehicle maintenance, but was not correctly notified to Network Rail and/or not notified within agreed timescales	Operator failure to follow agreed process	M0	TOC / FOC	E11.07
		Trains fails to connect to RBC. DMI may display lost connection icon.		SIM card configuration details & allocation to train / NR GSM-R network configuration		RBC & JRU / OTMR downloads. Telecoms Engineering Centre investigation. DRACAS investigation.	ETCS cryptographic keys were requested by the operator in accordance with the agreed process, but were not issued by NR	NR failure to follow agreed process	JR	NR	E11.08
							ETCS cryptographic keys were provided by NR but were not installed / were incorrectly installed on train	Operator error	M0	TOC / FOC	E11.09
							ETCS cryptographic keys were provided by NR, but were not installed in / were corrupted in RBC	Operator failure to follow agreed process	JR	NR	E11.10
							ETCS cryptographic keys issued by NR were not valid	NR error	JR	NR	E11.11
Issues Applying & Removing an Altered Speed Profile (TSR)	One or more train unexpectedly stopping at the same time & losing their MAs. Problems with RBC interface (e.g. erroneous function, no function, delayed response).	Receives TSR text message on DMI. Unexpected brake application (emergency brake). Transition into TR mode. Train loses MA.	Information about the speed profile change (affected area, time on/off). Information about the service at the time of applying the altered speed profile (# trains in section).	WON. RBC download. DRACAS investigation.	Signaller or Control Centre Technician error in applying altered speed profile.	Signaller error	OF	NR	E12.01		
					Equipment failure: * Problems with RBC interface screen when trying to apply new speed profile). * RBC failure.	System/Infrastructure/Software fault	IM	NR	E12.02		
Issues Applying & Removing T2 / T3 Line Blocks	System slow to respond when applying / removing	MA shortened or revoked	Information about the line block (affected area, time on/off).	WON. RBC download. DRACAS investigation. Control Centre Technician report.	* Problems with RBC interface screen when trying to apply new	Signaller error	OF	NR	E13.01		
	System applies line block incorrectly (nature of precise error will need to be described).				* RBC failure.	System/Infrastructure/Software fault	JR	NR	E13.02		
Train Attempts RBC Connection or Handover outside of expected Area.	MA revoked.	Unexpected brake application. Train transitioned to TR mode. Train loses MA. "No track description" message on DMI.	Location of train. Signalling design - train begins connection to RBC and then continues down a non-fitted route. Incorrect RBC details entered into the train / by balise, resulting in a call out of area.	RBC & JRU / OTMR downloads. DRACAS investigation.	Train is not within MA area (incorrect data in RBC).	Error with programming RBC data	JR	NR	E14.01		
					Wrong RBC selected	Driver/operator manually entering RBC number does so incorrectly.	TS / FI / M2	TOC/FOC	E14.02		
Other Miscellaneous Equipment Issues	None	DMI visibility issues (too bright, too dark).	Cab-equipment standards & settings.	JRU / OTMR downloads. DRACAS investigation.		Train fault	M2	TOC / FOC	E15.01		
		Audible alarm issues (too loud, too quiet).					M2	TOC / FOC	E15.02		
		Erratic DMI behaviour (speedo, odometry, planning area etc.)					M2	TOC / FOC	E15.03		

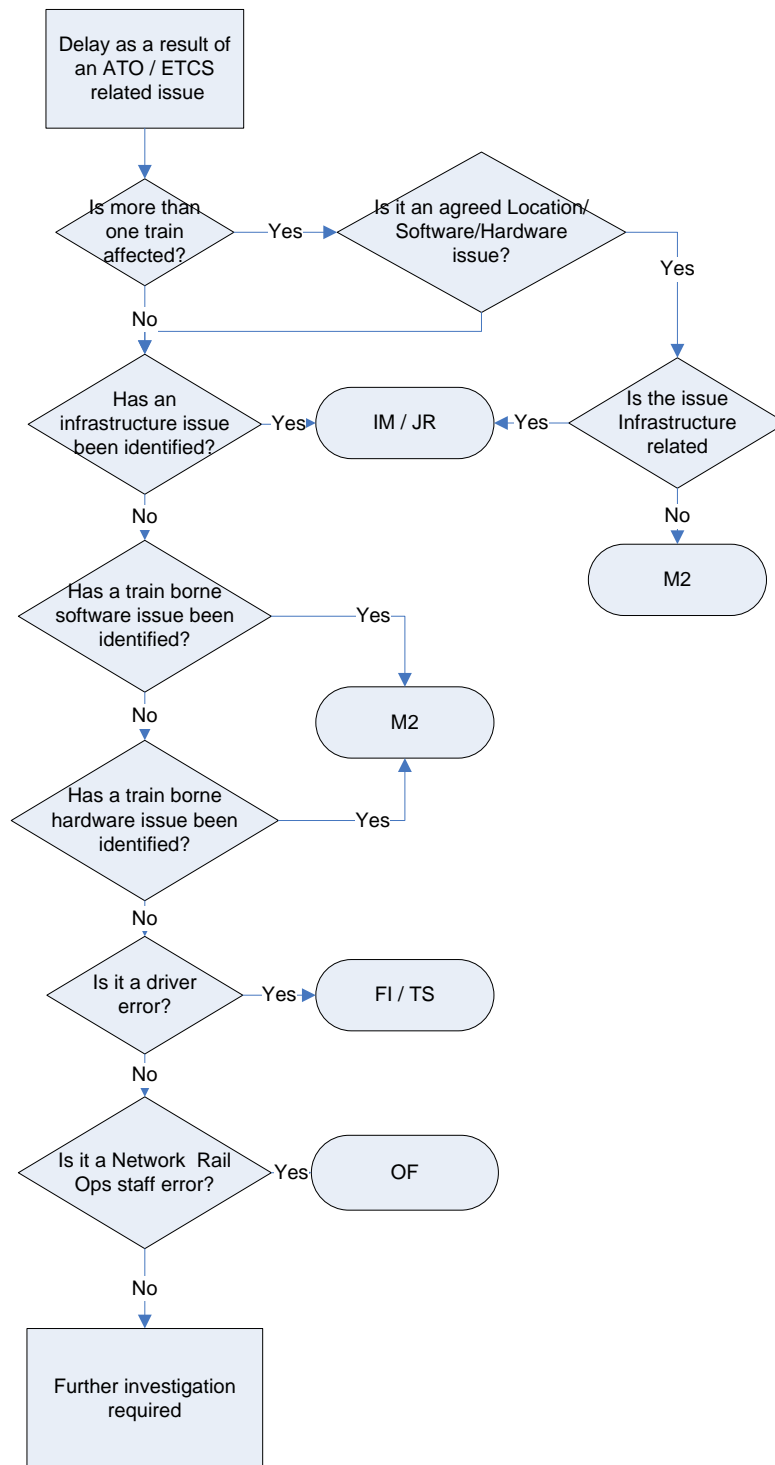
ETCS TABLE 3

Scenario	Signaller Incident Report	Driver Incident Report	Specific Information to Aid Diagnosis	Other Relevant Information <i>(not necessarily available at time of incident)</i>	Primary Cause	Attribution Principles	DAPR Coding	Responsibility	IRG Code		
Time Loss in Running / Train Takes Longer in Section Takes Longer than Planned	Train slow through section.	No symptoms reported	Train running at lower than permitted speed	RBC & JRU / OTDR downloads. DRACAS investigation. Train Planning Values in affected area.	Driver/Train	As per DAPR	M* / TS / FI	TOC / FOC	E16.01		
			Train running at permitted speed, but still lost time		Insufficient SRT/TT allowance.	To train planning code	QA / QM	NR	E16.02		
					Loss of National Values	On board error - loss of national values	M2	TOC/FOC	E16.03		
					Loss of National Values	National Values not reprogrammed correctly following maintenance at depot.	M2	TOC/FOC	E16.04		
					Loss of National Values	Incorrect NVs specified with more onerous restriction on speed *e.g change to trackside not reflected in NVs)	QA / QM	NR	E16.05		
					Loss of National Values	Train re-routed over balise with incorrect NVs	QA / QM / QN / OF	NR	E16.06		
					More onerous supervision	Reason for degraded running - causal event	As per DAPR	NR / TOC / FOC	E16.07		
					System slow to update MA.	GSM-R system slow to respond.	To GSM-R code.	JO	NR	E16.08	
					Level NTC train following ETCS train through ETCS L2 section (can't make use of virtual blocks so delay occurs).	TRUST time loss in running report. DRACAS investigation.	Cause of train running in Level NTC	Attribute to reason train was running in level NTC	Causal Event	NR / TOC / FOC	E16.09
					ETCS train following Level NTC train through ETCS Level 2 section (catches up train and delayed).	DRACAS investigation. Train Planning Values in affected area.	Cause of train running in Level NTC		Causal Event	NR / TOC / FOC	E16.10
Train presents early causing regulation decision to be required.	Train faster than expected through section.	Driver unaware of any issues	Sectional running time performance (consistently over-achieving SRT).	RBC & JRU / OTDR downloads. DRACAS investigation. Train Planning Values in affected area.	Incorrect TT allowance.	To train planning code.	QA / QM	NR	E17.01		
			Sectional running time performance (one-off)		Train booked to run in front of this train has been removed/late/cancelled	Early Running Principles / Train Planning Code (if booked) Unplanned / Planned	OF / QM	NR	E17.02		
			Sectional running time performance (consistently over-achieving SRT).		Speedometer/odometry fault, causing train to under-report its own speed	Train fault	M2	TOC/FOC	E17.03		
		Driver put train into TR mode	Driver put train into TR mode - overriding ETCS and going faster than planned speed		Driver error/decision	To reason for train being put into TR mode	FI / TS / Causal incident	TOC / FOC	E17.04		
Application of Proceed On-Sight Authority for Right Side Train Detection Failure.	Sent POSA authority.	EoA shortened to protected affected area. Observes lineside POSA aspect. Train transitions from FS to OS. ATO reverts to manual.			Track circuit / axle counter failure.	Reactionary delay. Track circuit / axle counter failure.	I3	NR	E18.01		
Train cancelled due to known software incompatibility	Route knowledge	Train not taken into service / Train not fit to run on line	Train category and system version (trackside / onboard) / Compatibility / Interoperability restrictions / Sectional Appendix	Original incident report (triggering the diversion) / Fleet plans / Sectional Appendix etc.	As per primary cause of incident requiring diversion	As per primary cause of diversion	Causal Event	As per primary cause	E19.01		
					System incompatibility	Error in project planning	QA / QM	NR	E19.02		
						Wrong stock allocated to diagram	MU / TA	TOC/FOC	E19.03		
						TOC unable to upgrade software in agreed timescales (per Network Change)	TR / M2	TOC/FOC	E19.04		
						ETCS not available on unit	QA / QM / QN / OF	NR	E19.05		
					Other identified cause	As per identified cause	As per DAPR	identified cause	E19.06		
Wrong Route Set and taken by the driver whilst under ETCS operations	Wrong Route Set and driver taken route	Wrong Route Set and taken	Non-overlay system / no notification to driver in cab	RBC & JRU / OTDR downloads / Signaller / Driver logs	Incorrect route set - no opportunity for driver to challenge wrong route		OF	NR	E20.01		
			Overlay system / notification to driver is made in advance		Incorrect route set - opportunity for driver to challenge was not taken	Principles applied as per DAPR for wrong routing	OF / TG / FC	TOC/FOC	E20.02		

6) ATO Scenarios Table

Scenario	Signaller Incident Report	Driver Incident Report	Other Relevant Information <i>(not necessarily available at time of incident)</i>	Primary Cause	Attribution Principles	DAPR Coding	Responsibility	IRG Code
Time lost in running (train does not operate in ATO)	Train not in ATO	ATO not engaged / drops out	Signaller's logs / Signalling JRU	ATO inhibited by the signaller	cause of ATO inhibit	Causal Incident	NR / TOC / FOC	A1.01
				System fault (onboard / trackside /comms)	As per failure mode	M2 / IM / J0 / JR	NR / TOC / FOC	A1.02
				Driver de-selects ATO as not trained or non preferred.	Driver	FI / TS	TOC / FOC	A1.03
Time lost in running (train does not operates in ATO)	Train drops out of ATO	ATO behaves erratically	JRU / OTMR etc. download	Driver takes manual control owing to ATO system fault	various (on board fault / infrastructure fault)	IM / JR / M2	NR / TOC / FOC	A2.01
Time lost in running	Slow progress of train between stations	Slow journey time between stations	JRU / OTMR etc. download	Incorrect journey time provided in ATR	Network Rail	QA / QM	NR	A3.01
				System fault (onboard / trackside /comms)	Per fault	M2 / IM / J0 / JR	NR / TOC / FOC	A3.02
				TSR / ESR applied or left applied	Controller / Signaller	OF	NR	A3.03
				<reactionary delay following a slow train>	r/a	YC / YD	Reactionary	A3.04
				Updated journey plan not delivered to train	System - NR or Siemens (Op)	IM / M2	NR / TOC / FOC	A3.05
				Incorrect journey selected by driver	Driver / TOC	FI / TS	TOC / FOC	A3.06
				Low adhesion setting activated / left activated	ETCS low adhesion is NR ATO low adhesion is Operator	OF / FI / TS	NR / TOC / FOC	A3.07
Station overtime	Excess dwell at station	Long dwell countdown / 'station hold'	JRU / OTMR etc. download	Incorrect dwell time provided in ATR	Network Rail	QA / QM	NR	A4.01
				Incorrect use of station hold	Controller / Signaller	OF	NR	A4.02
				Driver error (must press ATO start to proceed)	Driver / TOC	FI / TS	TOC / FOC	A4.03
				System fault (onboard / trackside /comms)	Per fault	M2 / IM / J0 / JR	NR / TOC / FOC	A4.04
Train fails to call	Train fails to call	Train fails to call	JRU / OTMR etc. download Signaller's logs	Skip stop activated by controller / signaller	Controller / Signaller	OF	NR	A5.01
				System fault (onboard / trackside /comms)	Per fault	M2 / IM / J0 / JR	NR / TOC / FOC	A5.02
				Skip stop activated by driver	Driver / TOC	FI / TS	TOC / FOC	A5.03
Minor delay	Train stopped	Train brought to a stand at ATO border	Check logs, check signal aspect / movement authority	Driver error (must take manual control in advance of ATO border)	Driver / TOC	FI / TS	TOC / FOC	A6.01
				System fault (onboard / trackside /comms)	Per fault	M2 / IM / J0 / JR	NR / TOC / FOC	A6.02

7) Process Flow Diagram



Note 1: Where an investigation is incomplete, attribution should be made to the Access Party from which the required information, relevant to the prime cause, was not provided.

Note 2: When both parties agree that an investigation has been concluded, and no cause has been identified, the incidents will be coded to Network Rail responsibility.

Note 3: For GSM-R related issues affecting ATO or ETCS operation please refer to the GSM-R IRG

8) Abbreviations

Abbr.	Meaning
ATO	Automatic Train Operation
ATR	Automatic Train Regulation
BTM	Balise Transmission Module
DMI	Driver Machine Interface
EoA	End of Authority
ESO	Emergency Stop Order
ESR	Emergency Speed Restriction
ETCS	European Train Control System
EVC	European Vital Computer
FS	Full Supervision Mode (Within ETCS)
FTN	Fixed Telephone Network
GPS	Global Positioning System
GSM-R	Global System for Mobile Communications - Railway
JRU	Juridical Recording Unit
L-NTC	Level National Train Control
MA	Movement Authority
NFF	No Fault Found
NV	National Value
OS	On Sight Mode (Within ETCS)
OTMR	On Train Monitor & Recorder
POSA	Proceed on Sight Authority
RBC	Radio Block Centre
SDO	Selective Door Opening
SH	Shunt Mode (Within ETCS).
SN	System National Mode (Within ETCS).
SoM	Start of Mission
SPAD	Signal Passed at Danger
SR	Staff Responsible Mode (Within ETCS).
SRT	Sectional Running Time
TIU	Train Interface Unit
TR	Trip Mode (Within ETCS)
TSR	Temporary Speed Restriction
TT	Time Table
WON	Weekly Operation Notice

9) Glossary of Terms

Term	Meaning
Adhesion	Refers to rail-head conditions. Where weather conditions (e.g. ice, rain) or rail head contamination (e.g. leaves) result in reduced friction at the wheel/rail interface, trains wheels may slip on the rail, resulting in faster acceleration / slower deceleration than planned. Adhesion settings in ETCS and ATO can amend the acceleration / braking profiles to be used by the train in the event of poor adhesion.
Causal Event	The event that caused the primary delay
Control Centre Technical	A Network Rail role with duties for the management and maintenance of signalling equipment within control centres.
Co-operative Movement Authority shortening	Describes the shortening of the distance ahead a train is authorised to travel. In co-operative shortening, the RBC proposes a new End of Authority at a location closer to the train than the current End of Authority. The on board equipment checks if the train can be stopped without a brake intervention by the revised location. If that is possible the new End of Authority will be accepted by the ERTMS on board equipment. If it is not possible the request will be rejected and the previous Movement Authority remains valid.
Emergency Stop Order	An instruction issued by the Radio Block Centre to a train or to trains commanding them to perform an emergency stop.
End of Authority (EoA)	The End of Authority marks the limit of the train's authority to proceed along a line of route, broadly analogous to a 'red' aspect signal in conventional signalling.
ETCS Level NTC, 1, 2, 3	<p>Descriptions of the type of ETCS technology deployed in a particular area. Under Level 1, movement authority information is typically only provided from trackside to train through balises in fixed locations on the track. Train detection /separation is undertaken using fixed blocks. Under Level 2, movement authority information is typically provided over the air via GSM-R radio, and train detection / separation is undertaken using fixed blocks. Under Level 3, movement authority information is typically provided over the air via GSM-R radio, and train detection /separation is undertaken dynamically using train position.</p> <p>Level NTC describes trains operating in accordance with prevailing national train protection systems (e.g. AWS & TPWS), where this is processed through the ETCS on-board.</p> <p>Types of ETCS may have different Versions.</p>
Full Supervision mode	Mode within ETCS. Gives full protection against overspeed and overrun.
Movement Authority (MA)	The authority provided by the signalling system permitting a train to proceed to a given location along the trackside.
National Values	Configurable values within ETCS that can be customised for a particular ETCS deployment, for operational or safety reasons. These describe, for example, maximum permitted speeds or distances to travel in particular ETCS modes for a given ETCS deployment.

Term	Meaning
On Sight mode	Mode within ETCS. Provides the driver partial responsibility for the safe control of the train. In this mode the train possesses a movement authority but the track ahead might be occupied by another train.
Overlay	An area of line which has both ETCS and conventional signalling fitted, over which train in ETCS would use ETCS, trains which are not fitted with, or have failed to transition into ETCS, use conventional train protection systems.
Revocation	<p>The cancellation of a previous instruction. For example, revocation of a movement authority cancels the previous granting of a movement authority. Revocation of a movement authority could take place:</p> <ul style="list-style-type: none"> • In a safety critical situations where a train must be stopped as quickly as possible, e.g. if a wrong route has been set or due to an external event on track. • To make new routeing arrangements - e.g. to run a train ahead of another at a junction. • As a result of a system failure
Shunting mode	Mode within ETCS designed for shunting movements. Provides limited protection against overspeed and overrun.
Staff Responsible mode	Mode within ETCS. Allows a driver to take full responsibility for the movement of a train in an equipped area. ETCS will impose a speed limit in this mode.
Supervised Location (SvL)	In ETCS, the track location beyond the End of Authority which the train protection functions of ETCS will act to minimise the risk of a train passing. Broadly analagous to a signalling overlap in conventional signalling.
System National mode	Equivalent to level NTC.
system version	The Version of ETCS being deployed. Versions describe the specification to which the ETCS system (trackside/train) has been designed, and are determined and published by the European Rail Agency.
T_NVCONTACT	The maximum time a train is permitted to continue travelling without receiving updated safety-related data from the RBC. Determined by National Values, and designed to protect the movement of trains in the event of communications failure.
T2	Describes a line blockage
T3	Describes a possession of a running line for engineering work
Telecoms Engineering Centre	The centre from which the GSM-R network is monitored and managed.
train category	Type of train (passenger / freight etc.)
Trip Mode	The mode of ETCS when a train has passed its End of Authority (equivalent of passing a signal at danger). Causes the emergency brake to be applied and special arrangements are required before the train can move off again.