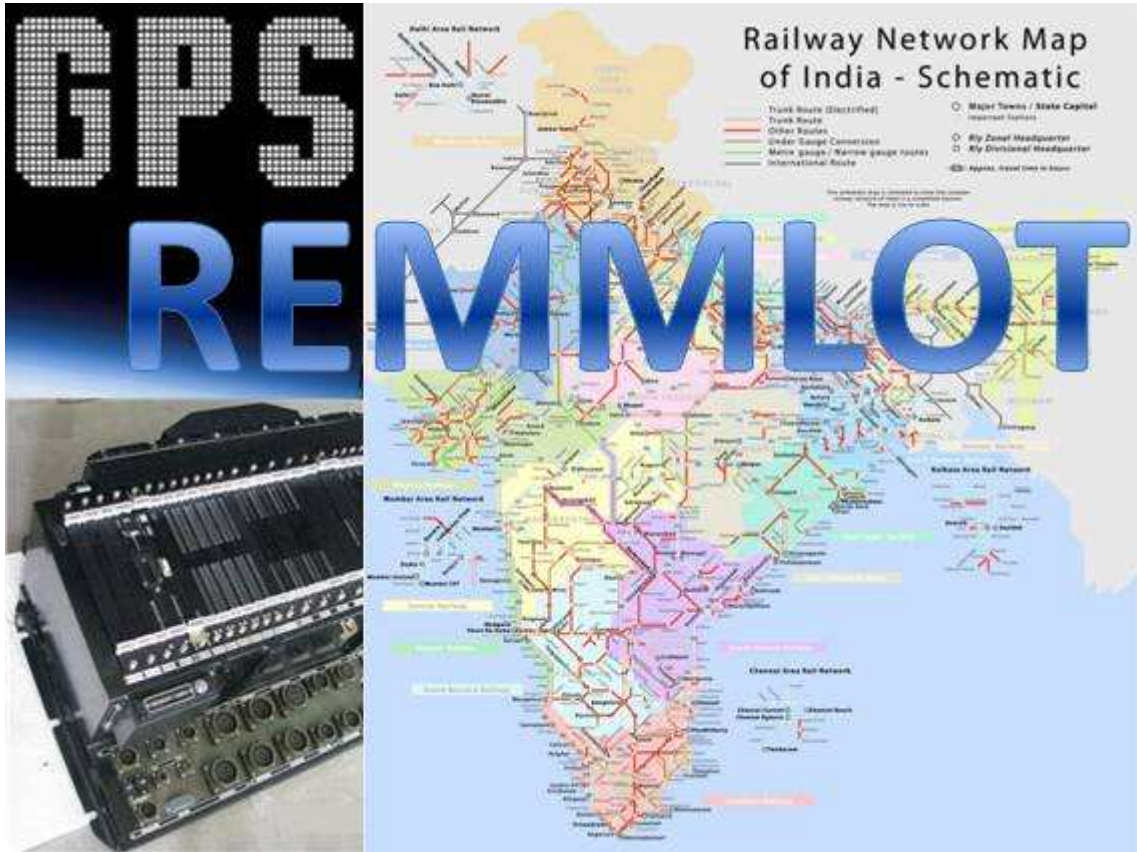


## रेमलोट: भाग-0

### REMMLOT: PART-0 (OVERVIEW)



Specification Number	MP.04.02.04	Date of Issue	[dd/mm/yyyy]
Revision	5		

#### Brief Description

This is a part of a four part specification numbered 0 through to 3 describing the requirements for setting up systems for Remote Monitoring of Locomotives and Trains (REMMLOT).

## **FOREWORD**

REMMLOT Enables remote monitoring of Diesel Locomotives. It creates a complete IT enabled ecosystem which provides a platform for remotely monitoring health and operational characteristics of diesel electric locomotives.

It also enables monitoring of performance of crew and helps in identifying lapses, e.g. when he passes a signal at danger. This will enable focused counselling and training of such crew, who are prone to unsafe working.

REMMLOT also monitors condition of locomotive and makes preventive maintenance of locomotives more effective. REMMLOT monitors shutting down of locomotives when idle for a long time and generates management information to ensure this.

The complete specification for REMMLOT is split over four parts numbered from 0 to 3. Together these parts specify the requirements for setting up the complete system.

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## LIST OF AMENDMENTS

S. No.	Amendment Date	Revision	Details
1.	Sep 2007	0	First issue
2.	Jul 2008	1	First revision
3.	Jan 2010	2	Second revision
4.	Apr 2010	3	Merged and made common specification for ALCo and EMD design of locomotives.
5.	Aug 2010	4	Fourth revision
6.	Aug 2011	5	Specification revised to meet new requirements stated by Railway Board in their letter number 2011/M(L)/459/2-Pt dt 25/03/2011 and 2007/M(L)/466/19(84)Vol-II dt 28/07/2011.

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## LIST OF REFERENCED DOCUMENTS

S. No.	Document name / number
1.	MP.0.24.00.26 Specification of MBCS Systems for ALCO locomotives
2.	MP.0.24.00.43 Specification of MBCS Systems for EMD locomotives
3.	Report No. MP.Misc-253 date 31-03-2010
4.	MP-MOD-EC-05-27-10-March-10
5.	MP.0.04.00.10 RDSO Specification for DIALS
6.	MP.0.04.02.04 Part-0 REMMLOT Overview (This document)
7.	MP.0.04.02.04 Part-1 REMMLOT LRMS

Document No:	MP.0.04.02.04-Part-0	Revision No: 5	Date Issued: dd/mm/yyyy
Specification Title: REMMLOT – Overview			

S. No.	Document name / number
8.	MP.0.04.02.04 Part-2 REMMLOT LTMS
9.	MP.0.04.02.04 Part-3 REMMLOT Control Office Equipment

## LIST OF ANNEXURES

Annexure 1	Performance parameters for REMMLOT
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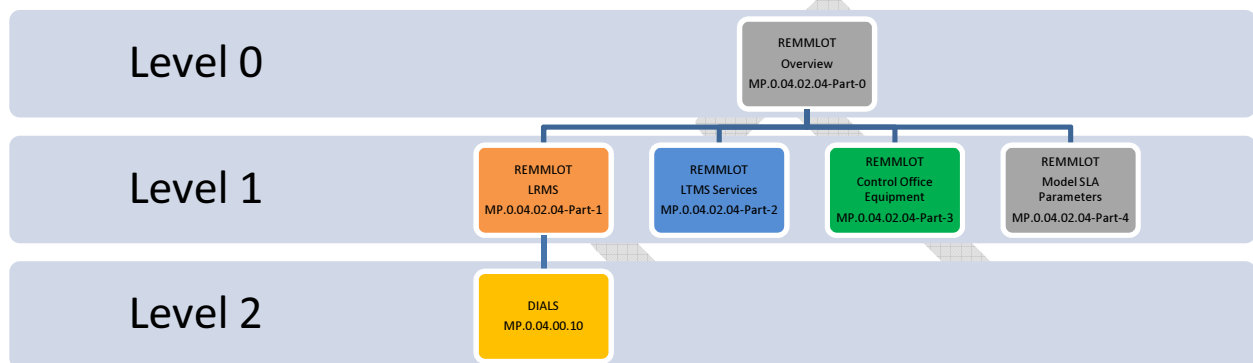
## 0 Introduction

This document is part of set of documents specifying equipment and services for the deployment of REMMLOT. Kindly see the list of referenced documents for locating other documents of the set.

Diesel locomotives of IR are now fitted with Microprocessor based control, which have fault diagnostic and locomotive health monitoring system. These systems capture the operational and performance data of locomotive continuously.

This document provides the overview of a set of specifications that aim to capture, relay, analyze and present this data to maintainers for improving maintenance by applying condition monitoring strategies.

The specifications of this set of equipment / service requirements are detailed in their respective specification. The relationships of the different specifications included in this set are as given in the diagram below:



**Figure 1: Hierarchy of Specifications**

## 1 Objectives and Scope

This document outlines the scope of requirements and the inter-relationships for setting up REMMLOT systems. The complete deployment of REMMLOT requires the following sub-systems:

- Locomotive Remote Monitoring System (LRMS) consisting of the on board equipment
- Locomotive & Train Management System (LTMS) consisting of datacentre, internet portal and 24x7 Technical Helpdesk.
- Facilities for access at Diesel Shed's

The implementation of REMMLOT will require equipment and services to be procured. The related specifications contain the technical details for the procurement and equipment and services. A model document for implementing a Service Level Agreement is also provided for ensuring that the quality of outsource services are monitored and measured ensuring acceptable level of service and taking appropriate corrective and preventive action.

## 2 Terminology / Abbreviations

S. No.	Term / Abbreviation	Description
1.	IR	Indian Railways
2.	DLW	Diesel Locomotive Works
3.	DMW, DLMW	Diesel Loco Modernization Works, Patiala
4.	RDSO	Research Designs & Standards Organization
5.	MBCS	Microprocessor Based Control System
6.	SADS	Situation Awareness Display System
7.	TDMS	Technical Data Management Streaming
8.	RDBMS	Relational Database Management System
9.	FTP	File Transfer Protocol
10.	GPRS	General packet radio service (GPRS) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications
11.	EDGE	Enhanced Data rates for GSM Evolution (EDGE) is a digital mobile phone technology that allows improved data transmission rates as

		a backward-compatible extension of GSM
12.	DIADEM	DIAdem is software specifically designed to help engineers and scientists quickly locate, inspect, analyze, and report on measurement data using one software tool.
13.	REMMLOT	Remote Monitoring of Locomotives and Trains.
14.	LRMS	Locomotive Remote Monitoring System
15.	DIALS	Digital Into Analog LCD based System
16.	LTMS	Locomotive and Train Management System
17.	TDMS	Technical Data Management Streaming a file format created by NI
18.	NI	National Instruments
19.	RTC	Real Time Clock
20.	GPS	Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites
21.	XML	Extensible Markup Language (XML) is a set of rules for encoding documents in machine-readable form. It is defined in the XML 1.0 Specification produced by the W3C, and several other related specifications, all gratis open standards
22.	MMD	Maximum Moving Dimensions. The maximum size of rolling stock that can be safely moved on Indian Railways without infringement.
23.	APM	Application Performance Management (Measurement)

**Table 1: Abbreviations**

### 3 Definitions

#### 3.1 SADS

Situation Awareness Display System (SADS) is a network of PCs connected to multiple large-screen LCD monitors which displays real-time information

#### 3.2 Geo-fence

A geo-fence is a virtual perimeter for a real-world geographic area. This is developed using GPS sensing and referencing with a set of coordinates stored in a database that define the virtual fence.

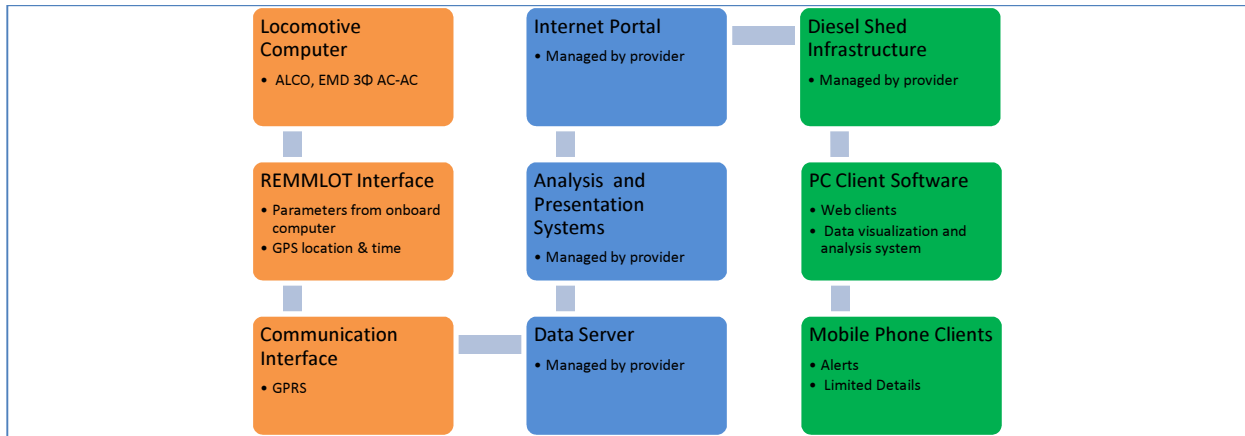
### 4 Brief description of the system/equipment/components

The overall aim of the project is to provide an intelligent, time saving infrastructure that provides capability to identify and grade locomotives in real-time for proper planning of maintenance and prevention of line failures.

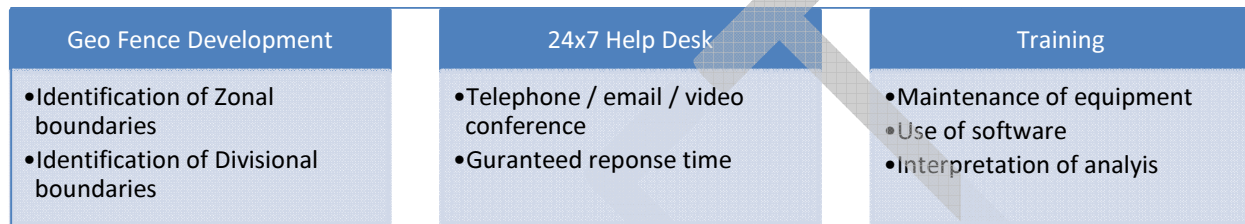
The complete REMMLOT system shall consists of locomotive on-board equipment, communication interface, data logging server, data analysis engine, data presentation application, user client (both PC and cellphone based). A 24x7 helpdesk is specified for providing assistance for maintenance of system and also for troubleshooting of the locomotives.

The data shall be collected from the locomotive computer, relayed to the remote server via a GPRS link. The data shall be stored on the server, analyzed as per pre-defined or user defined rules and presented via simple and easy to use web interfaces.

The following figures provide the overview of the equipment and services that are required for implementation of REMMLOT.



**Figure 2: Overview of REMMLOT (In-line functions)**



**Figure 3: Overview of REMMLOT Support Functions**

## 5 General requirements

The equipment supplied against this specification shall meet the following general requirements.

- The equipment supplied shall be of good quality, rugged and reliable and capable to withstand environmental and use conditions. The individual components shall meet the lifecycle for that category of equipment.
- Wherever outsourced equipment is used care shall be taken to ensure that the equipment is sourced from reputed manufacturers.
- The supplier of equipment supplied under this specification shall ensure proper interfacing and connectivity between equipment / software.

## 6 Functional Requirements

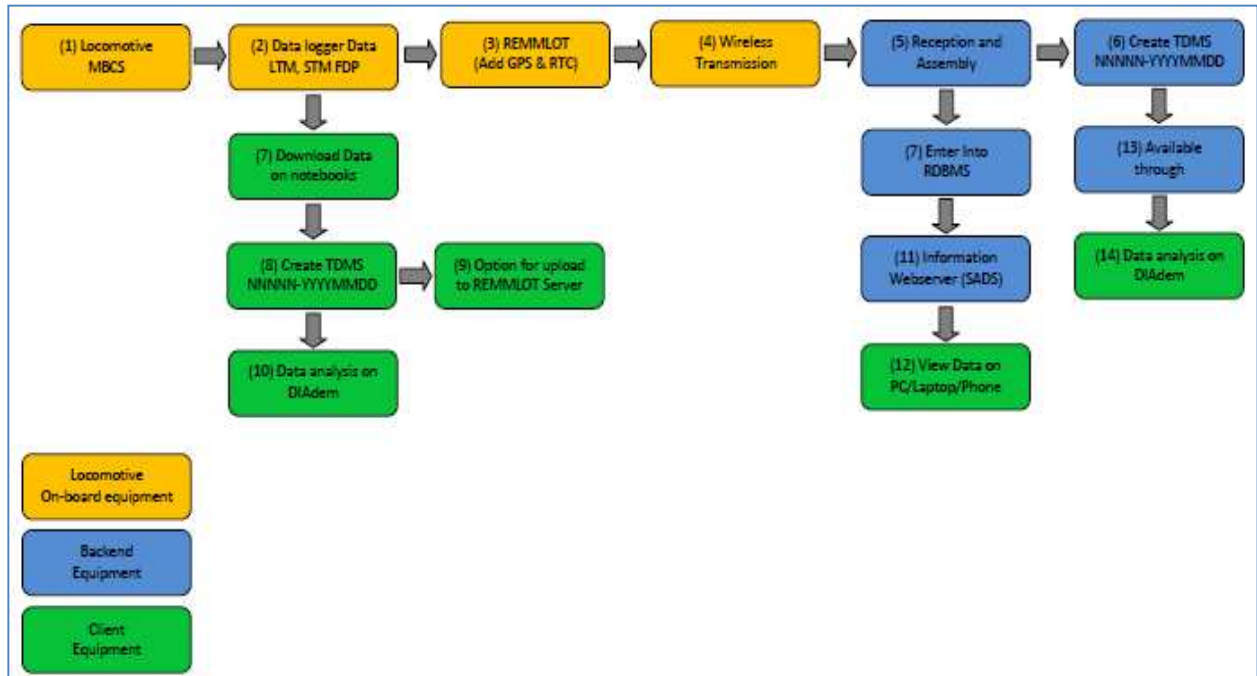
The expected functional requirements of the system components are provided briefly as under.

- **Locomotive on board equipment:** shall interface to the locomotive Vehicle Computer in a manner such that all parameters acquired by the vehicle computer are available for further processing. This equipment shall have its own independent GPS system for getting the geographical location..
- **Communication system:** Locomotive on-board equipment shall be equipped with GPRS/EDGE/CDMA based communication system for relaying of acquired data.
- **Data logging servers:** These servers shall be located at the data centre of the supplier / service provider. Server for logging data relayed by the locomotive on-board devices.
- **Data analysis and presentation systems:** These shall be server side applications running at the data centre of the provider and shall analyze the data as per predefined / user defined rules. This software shall also prepare the information generated for display on the internet portal.
- **Internet Portal:** A secure internet portal shall form the user interface of the REMMLOT system. All users shall interact through the portal.
- **Client applications:** PC and mobile applications shall form the applications for interaction for users. Additionally data analysis and visualization application shall be provided on the PC for further analysis as required by the user.



- **Geo-fence development:** All providers shall be required to develop geo-fences for identification of locomotive location. These fences shall demarcate boundaries of railway zones and divisions.
- **24x7 technical helpdesk:** This helpdesk shall provide support for running of the system.
- **Training:** Training of users shall be an inherent part of service to be delivered. The users shall be trained for use of different applications and software provide.

The following figure depicts the overview of the dataflow for REMMLOT data.



**Figure 4: REMMLOT Data Flow**

The REMMLOT system shall collect the data logged by the locomotive MBCS and transmit this data to a remote server. This data shall be processed at the server end and provided to the diesel sheds via web (http) and file transfer protocol (ftp) modes.

The webserver shall present information using the concept of SADS (Situation Awareness Display System).

The files shall be presented in TDMS format (Technical Data Management Streaming format of National Instruments). These files shall be provided through an FTP interface.

The complete system has purchased components and outsourced services. The purchased components shall be tested as per requirement of the specifications. The outsourced services shall be tested and monitored as per service level agreements for the same.

The detailed functional requirements, specifications, testing criteria of the subsystems indicated the figures are listed in the respective system specifications.

## 7 Technical Requirements

Detailed technical requirements for each component of the REMMLOT systems are provided in the relevant part of the specification.

## 8 Applicable drawings

Applicable drawings (if any) for each component of the REMMLOT systems are provided in the relevant part of the specification

## 9 Safety Requirements

All equipment provided under this specification shall meet the existing safety norms as applicable for the respective environment. The applicable norms are listed in the relevant part of the specification.

## 10 Environmental / climatic requirements

All equipment provided under this specification shall meet the prescribed environmental requirements as prescribed in the relevant part of the specification.

## 11 Referred standards

The following standards are referred by this specification. It is requested to kindly ensure operational understanding of all the referred standards.

- NMEA 2000 (IEC61162-3) for sharing of GPS Data
- IS 2500 for sampling plans
- ISO 9001 for Quality Management System
- TIA-942 for server uptime
- ISO 27001 for information security management systems
- CMMI-SVC for service provision
- ISO 9421 guidelines for user interface development
- UL 60950 for safety of mains powered equipment.
- IEC 60571 for rail road electronics
- AAR-S-5702 for testing for affect of working environmental conditions

## 12 Maintenance and diagnostic aid

As listed in the relevant part of the specification.

## 13 Documents to be supplied by the equipment supplier

As listed in the relevant part of the specification.

## 14 Accessories

As listed in the relevant part of the specification.

## 15 Training

As listed in the relevant part of the specification.

## 16 Tests and verification

As listed in the relevant part of the specification.

## 17 Types of tests

As listed in the relevant part of the specification.

## 18 Painting labeling and marking

As listed in the relevant part of the specification.

## 19 Packing and delivery

As listed in the relevant part of the specification.

## 20 Guarantee / Warrantee

The IRS conditions for guarantee / warrantee shall be applicable.

## 21 Intellectual Property Rights

### 21.1 Undertaking by equipment manufacturer

All the specifications issued by RDSO shall include a requirement of undertaking to be signed by Vendors on “INFRINGEMENT OF PATENT RIGHTS”. The undertaking can be as under

Indian Railways shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, use of similar components in the design & development of this item and any other factor not mentioned herein which may cause such a dispute. The entire responsibility to settle any such disputes/matters lies with the manufacturer/ supplier.

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### 21.2 Declaration of confidentiality of submitted documents by manufacturers

While submitting a new proposal/design, manufacturer must classify their documents confidentiality declaration, such as

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## 22 Information to be supplied by supplier

As listed in the relevant part of the specification.

## 23 Information to be supplied by purchaser

As listed in the relevant part of the specification.

## ANNEXURE 1: REMMLOT Performance Parameters

The following services shall be provided and monitored as part of this agreement.

S. No.	Service	Performance Parameter	Desired Value	Remarks
1.	GPRS/EDGE service for data transfer from locomotives	Ability to send data at rate better than once every 10 minutes.	Compliance better than 95%	This requirement shall be adhered to by the LRMS provider. The measurements shall be done at server side by using software tools developed by LTMS provider or by use of 3 <sup>rd</sup> party APM tools.
2.	Data centre	Uptime of internet site	As per TIA 942 Tier III	This requirement shall be adhered to by the LTMS provider. The measurements shall be done at server side by using 3 <sup>rd</sup> party APM tools.
3.	Data centre	Time to login to the site	Less than 10 seconds for 95% of login requests.	This requirement shall be adhered to by the LTMS provider. The measurements shall be done at server side by using 3 <sup>rd</sup> party APM tools.
4.	Data centre	Guaranteed minimum data transfer rate from site to client	128 kbps	This requirement shall be adhered to by the LTMS provider. The measurements shall be done at server side by using 3 <sup>rd</sup> party APM tools.
5.	Data centre	Time to respond to service request. (All types HTTP, FTP ODBC etc)	Less than 5 seconds for 95% of requests.	This requirement shall be adhered to by the LTMS provider. The measurements shall be done at server side by using 3 <sup>rd</sup> party APM tools.
6.	Operation of SADS and DAWS at control offices.	Equipment uptime including connectivity	Better than 95% of demand.	This requirement shall be adhered to by the LTMS provider. The measurements shall be done at client side by using 3 <sup>rd</sup> party APM tools.
7.	Operation of software clients.	Software uptime.	Better than 95% of demand.	This requirement shall be adhered to by the LTMS provider. The measurements shall be done at client side by using 3 <sup>rd</sup> party APM tools.
8.	Technical Support	Queries sent by email, letter, SMS	For 95% of cases, within 24hrs and problem resolution in 72 hrs	Measured on the ITS implemented by the LTMS service provider. Cases where response time is mutually agreed to be longer shall not be considered.

S. No.	Service	Performance Parameter	Desired Value	Remarks
9.	Technical Support	Deputation of personnel	For 95% of cases, within 24hrs and problem resolution in 72 hrs	Measured on the ITS implemented by the LTMS service provider. Cases where response time is mutually agreed to be longer shall not be considered.

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