



वितरित शक्ति नियंत्रण प्रणाली: भाग-0

DISTRIBUTED POWER CONTROL SYSTEM (DPCS) PART-0

OVERVIEW & FUNCTIONAL REQUIREMENTS



Specification Number	MP.0.400.02		
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Brief Description

This set of four documents (numbered part 0 to 3) describe the requirements for equipment required for setting up distributed power control for running of trains with diesel electric locomotives. The full set of specifications detail these for requirements of various sub components like, locomotive onboard equipment, radio frequency communications and functional requirements of the equipment with special features for ensuring fail safe operations.

FOREWORD

RDSO had initially issued two separate specifications for Remote Control System of diesel electric locomotives for distributed power applications. After initial field trials need for having interoperability between different makes of remote control systems was realized.

These set of specifications combine and bring together all previous specifications, experience gained through trials and additionally detail features necessarily required for creation of interoperable systems. As of date there are no global standards for interoperability of DPCS. Almost all implementations are of proprietary designs that do not interoperate. The requirements listed here create an initial platform for achieving interoperability. Therefore, interoperability as detailed in these documents is subject to trials. However when the systems described here is paired with identical systems, all features shall be available for distributed power applications.

This set of specifications are also planned to be extended to cover the requirements of Cab Display Unit for setting up End Of Train Telemetry (EOTT) which is under development separately. Sharing of a common radio modem for both DPCS and EOTT applications is the prime consideration. However this feature is planned to be incorporated in a subsequent revision of this specification.

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LIST OF AMENDMENTS

S. No.	Amendment Date	Revision	Details
1.	Feb 1986	0	First Issue
2.	April 2004	1	First Revision
3.	September 2008	2	Second Revision
4.	November 2011	3	<p>Specification revised to meet new requirements stated by Railway Board reference as below:</p> <ul style="list-style-type: none"> • Letter number 2011/M(L)/459/2-Pt dt 24/05/2011 • Minutes of meeting on Implementation of EOTT & DP Control on IR at Railway Board on 07/12/2010. <p>Specification re-drafted with following important features</p> <ul style="list-style-type: none"> • Requirements for interoperability • Mandatory use of DIALS for HMI • Use of specific radio communication system for reduced comm. Loss and interoperability • Draft common communication protocol for DPCS • Combined specification for all loco types • Features for sharing RF communication system from other applications <p>Note: Specification no. MP-0-0402-03 Rev-0 Oct-05 is now merged into this specification and is now superseded by this common specification.</p>

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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.	MP.0.04.00.10 RDSO Specification for DIALS

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S. No.	Document name / number
4.	MP.0.400.02 Part-0 DPCS – Overview & Functional Requirements (This document)
5.	MP.0.400.02 Part-1 DPCS – RF Communication Protocol
6.	MP.0.400.02 Part-2 DPCS – RF Communications System
7.	MP.0.400.02 Part-3 DPCS – Onboard Equipment for Locomotives with μ P-Controls and CCB

LIST OF ANNEXURES

Annexure 1	Handling Loss of Communication
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0 Introduction

This document is part of set of documents specifying equipment for the deployment of Distributed Power Control System (DPCS). Kindly see the list of referenced documents for locating other documents of the set.

DPCS allows multiple locomotives to be used at different locations over entire train consist. Such a system leverages the existing rolling stock and allows much longer trains to be run by minor up gradation of the locomotives.

This document provides the overview and the functional requirements of a set of specifications that aim to deployment of DPCS with interoperability features.

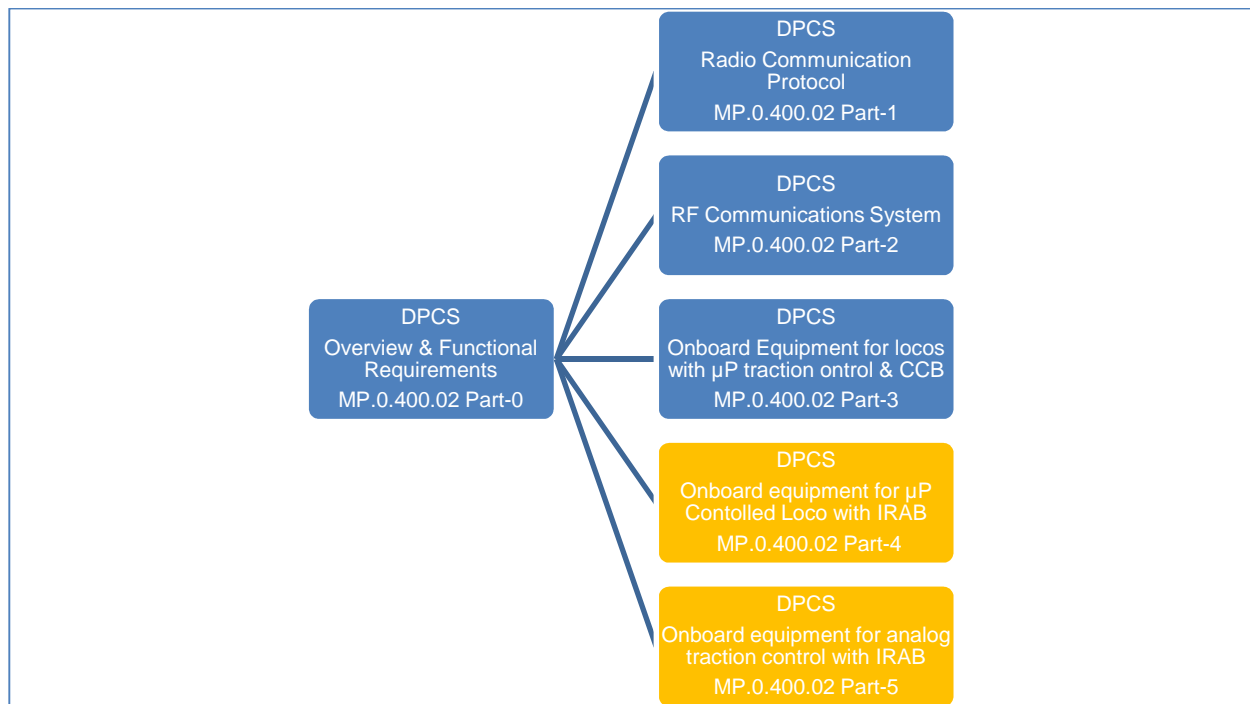


Figure 1: Hierarchy of documents



Note: The parts of the specification in yellow boxes are still under development and shall be released later, separately.

1 Objectives and Scope of the specification

This document outlines the scope of requirements and the inter-relationships sub-systems for setting up DPCS that are capable of interoperability across locomotive control systems sourced from different vendors and different locomotive classes.

Note: There is no global standard for interoperability of DPCS. The systems in operation on the various world railways are of proprietary design and do not interoperate. Indian Railways requires interoperability as it is expected that without this feature these systems can pose a constraint in the railway operations. Therefore this specification has been developed for incorporating this requirement. It shall be understood that interoperability features are currently experimental and shall be used only for trials under controlled conditions.

Since interoperability, among different makes, is yet to be established, this document allows for equipment manufacturers to provide their equipment such that these are capable of working in sets consisting of equipment of the same manufacturer with full features.

However, the equipment manufacturer is also required to implement features that permit interoperability among different makes of distributed power control systems so that all locomotives to work together as one integrated set of distributed power control system.

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.	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
7.	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
8.	REMMLOT	Remote Monitoring and Management of Locomotives and Trains.
9.	DIALS	Digital Into Analog LCD based System
10.	RTC	Real Time Clock
11.	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
12.	MMD	Maximum Moving Dimensions. The maximum size of rolling stock that can be safely moved on Indian Railways without infringement.

3 Definitions

The following definitions shall be applicable to these set of documents.



Note: These definitions have been significantly modified with reference to the older revisions to reduce ambiguity caused by overlapping definitions. A clear understanding of these definitions is recommended before proceeding further.

3.1 Master Locomotive Consist

Locomotive consist of one or more locomotives (directly coupled and controlled via MU coupler) attached at the head of the train. This consist shall be manned by a crew.

The DPCS of the locomotive set to 'lead' mode in the multiple loco consist, shall be the 'master' controller for the DP operations for the train. On remaining locomotives DPCS shall be disabled.

There shall be only one master locomotive consist on a train at any point in time.

3.2 Remote Locomotive Consist

Locomotive consist of one or more locomotives (directly coupled and controlled via MU coupler) attached at a location other than head/ leading position in a train consist. These locomotives shall be typically unmanned.

All locomotives in the remote consist(s) shall have the lead / trail settings set to trail or helper (depending on the locomotive control configuration).

Only one locomotive per consist shall have the DPCS enabled and set to 'remote', which shall be the controlling locomotive in the remote locomotive consist. On remaining locomotives DPCS shall be disabled.

One train consist can have upto four remote locomotive consists. These consists shall be identified unambiguously as: **Remote-1, Remote-2, Remote-3 & Remote-4** (the number increasing as distance from the master locomotive increases).

3.3 Lead locomotive

Lead locomotive is the locomotive configured for lead and the locomotive units are directly coupled and configured as multiple unit.

3.4 Trail locomotive

Trail locomotive is the locomotive configured for trail and the locomotive units are directly coupled and configured as multiple unit.

3.5 Synchronous Remote Control

Simultaneous repetition & execution of commands, given by “Master” locomotive to “Remote” locomotive by a wireless link, such as traction, air/vacuum braking, dynamic braking or any other functions performed by the driver of the master unit and duplicated (transmitted) in “Remote” units.

4 System components

The complete DPCS system shall consist of locomotive on-board equipment (including radio antenna), wireless communication, mobile & track side repeater (future development), DIALS along with an inbuilt system which shall communicate with the Pen drive / PC/ Laptop for configuration and data downloading.

The complete deployment of DPCS requires the following sub components as listed below:

4.1 Locomotive onboard equipment for DPCS

DPCS shall consist of locomotive onboard equipment with required interfaces for traction and brake control. This equipment shall be different for different locomotive types. The following table lists the different classes of locomotives, their traction and brake systems. The table also indicates the part of this specification detailing the requirements of locomotive onboard equipment applicable to the particular locomotive class.

S. No.	Traction Control System	Brake System	Locomotive Class	Applicable Part of this specification
1.	3-Φ AC-AC traction control system	Knorr Bremse CCB system	WDG ₄ , WDP ₄	Part-3
2.	AC-DC μP based traction control system	Knorr Bremse CCB system	WDG ₃ , WDM ₃	Part-3
3.	AC-DC μP based traction control system	IRAB	WDG ₃ , WDM ₃	Part-4 (Note: This document is under development.)
4.	Analog traction control system	IRAB	WDG ₃ , WDM ₃ , WDM ₂ WDP ₃ WDP ₁	Part-5 (Note: This document is under development.)

Table 1: Locomotive Classes with traction and brake control systems

4.2 Implementation of HMI with DIALS screen

The human machine interface for DPCS shall be implemented using DIALS. The DIALS for diesel electric locomotive is specified in RDSO Motive Power Specification number: MP.0.04.00.10.

4.3 Common wireless communication protocol for interoperability

The systems shall implement the RDSO draft wireless protocol for interoperability. This protocol document is a separate part of this specification.

This protocol shall be used when DPCS of different manufacturers are paired on a single train. However, when units of same make are used, manufacturers can implement their own protocol and control strategy for providing additional features.

4.4 Common RF Modem for ensuring seamless communication

All systems shall use a common and specified radio modem to keep loss of communications to minimum. The specified modem is described in a separate part of this specification.

4.5 For further development

The following requirements are planned for future developments and are only provided here as a roadmap.

- Implementation of Cab Display Unit (CDU) functionality for EOTT
- Trackside devices for boosting RF signals in areas of low signal strength.

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.
- The equipment described shall be designed / manufactured in conformance to IEC 60571 excluding the clauses for environmental conditions and its verification, testing.
- The equipment shall be in conformance to AAR S-5702.
- Failure Mode Effects and Criticality Analysis of the equipment shall be done during the design process in conformance to IEC 60812. The records of this analysis shall be provided upon requirement.

6 Functional requirements

The Distributed Power Control System (DPCS) shall provide features on the locomotive that shall enable one locomotive pilot in the master loco consist to control upto four remote loco consists on the same train. (One master consist + upto 4 remote consists). Each locomotive consist can be either single or multiple locomotives that are directly coupled and controlled through MU coupler.

This control shall be implemented through robust RF communication and the master and remote locomotives shall not be in direct electrical communication through train lines. However the trainlines shall be monitored for safety features.

DPCS shall also monitor the train brake pipe, for ensuring safety of operations.

DPCS shall meet the following functional requirements. These features shall be implemented in fail safe manner such that inadvertent, undesirable operations do not occur.

6.1 Communication and loco configuration functions

6.1.1 Secure wireless communication

The equipment provider shall ensure that the wireless communications are secure to prevent unauthorised access and control.

6.1.2 Selection of master or remote

Each DPCS unit shall be capable of working as master or remote unit. The mode of operation shall be selectable from through the DPCS HMI.

6.1.3 Interface with locomotive controls

The system shall interface and control the locomotive control system including the air brake system and transmit the information to the other DPC systems through wireless transmission for synchronized running of the train formation.

6.1.4 Communication to drivers display

DPC system shall communicate with the driver's display to provide the information regarding the status of the locomotives in the formation for controlling and operation of train formation.

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The DPCS HMI shall be provided on all control consoles of the locomotive such that it shall be possible to operate the locomotive in DP mode from any driving control stand.

6.1.5 Distance for control transmission

DPCS is expected to operate reliably with separation of upto 3000m between any two communicating units in all possible terrains in normal railway working environment.

Radio signals between any two DPCS shall not be affected by the overhead traction of 25 kV AC or 1500V DC supply of any other electric locos operating in the near vicinity of the train being operated with remote-control system

Any deviation from these requirements shall be clearly brought out.

6.1.6 Effect of adjacent units on other trains

DPCS shall provide failsafe arrangement in master and remote control units such that the systems on the same train are not affected by similar units in other trains available in near vicinity on same or adjacent tracks.

6.1.7 Pairing before movement

Failsafe and secure arrangement shall be provided to prevent starting of train from master unit unless the equipment in remote units have been paired and the confirmation is received in master unit.

Incase of multiple remote units, all remotes shall be paired with the master.

Brake pipe pressure drop test shall also be conducted before movement to verify

- All paired units are in the same train consist
- Are in proper working order (no errors reported)
- Are correctly configured and paired.

BP air flow shall be sensed and datum level fixed. The system shall inform the crew to confirm the detected leakage level.

The HMI interaction and the step by step process for pairing shall be approved by RDSO prior to use on the locomotive.

6.1.8 Setting of loco orientation

The system shall have suitable menu / switch on the HMI that shall make it possible to select the locomotive orientation for both master and remote units.

The orientation setting of remote and master together shall be used determine the correct direction of movement of the remotes. This is essential to ensure that all locomotives move in the selected direction.

6.1.8.1 For Master Locomotive

The system shall allow setting the following options for locomotive orientation:

- Loco with short hood leading (Cab-1 for dual cab locos)
- Loco with long hood leading (Cab2 for dual cab locos)

6.1.8.2 For Remote Locomotive

The system shall provide options to set locomotive orientation with respect to the master locomotive. Unambiguous terms shall be used for selection like

- Master loco towards short-hood (Cab 1 for dual cab locos)
- Master loco towards long-hood (Cab2 for dual cab locos)

6.1.9 Synchronization of system RTC (Real time clock)

The DPCS systems shall synchronize the system RTC at time of pairing. If paired for longer durations RTC's shall be synchronized atleast once in 24 hours.

The RTC of the master DPCS unit shall be taken as reference.

6.1.10 Logging of commands

The DPCS shall log all commands sent / received and implemented with the timestamp using time from local RTC.

Command logging shall be done on all working units irrespective of whether the unit is the master or remote.

6.2 Control of locomotive functions

The following paragraphs detail how important locomotive controls & indications shall be relayed and executed between the master and the remote locomotives in case of synchronous control.

The details provided here are not exhaustive and it is recommended that the developer of the equipment shall read the respective locomotive control system design operations and maintenance documents for a comprehensive understanding.

6.2.1 Command characterization for locomotive control

The DPCS shall implement the following different methodology for command characterization and execution on the remote units.

6.2.1.1 Synchronous control methodology

Under this methodology all operations on the master control systems shall be mirrored on the remote controllers in a deterministic manner in real-time.

This command characterization shall be implemented as default when using the DPCS in interoperable mode.

6.2.1.2 Proprietary control methodology

When identical systems are paired, to work together, the equipment manufacturers shall provide their own command characterization for DPC operations. All manufacturers shall get the command characterization methodology approved by RDSO prior to use on line.

6.2.1.3 Independent control methodology

This methodology shall permit operator to select individually the controls for each remote unit independently from the master unit.

This feature shall be provided with password security feature.

6.2.2 Direction of movement

The direction of movement shall be decided by the master locomotive from the setting of the reverser handle on the operative control stand.

The remote locomotives shall be provided with this data and the DPCS controller shall determine automatically determine the correct direction of movement based on the orientation setting of the locomotive (described under configuration settings)

6.2.3 Throttle control:

Operation of throttle handle in each position from idle to 8th notch when carried out on the master unit shall be transmitted and repeated on remote unit whether throttle handle is moved for notching up or notching down.

Actual notch position after it has physically taken place on remote unit shall be indicated distinctly on the master unit. Provision shall exist to indicate if power cut-off has taken place on the remote unit as a result of emergency application or due to any other reason.

It shall not be possible for any unauthorized person to operate the master controller.

6.2.4 Dynamic brake control:

As soon as master unit dynamic brake selector handle is moved to dynamic braking position, the remote unit controls shall also automatically switch over to the same position. The extent of dynamic brake applied by remote unit shall be displayed on master unit either in terms of handle position or dynamic brake current.

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An interlock provided for cutting off dynamic brake and applying full locomotive brakes, in case of emergency brake application when actuated on the master unit shall actuate simultaneously on remote unit. Similarly, the interlock for cutting off the loco proportionate brake when dynamic brake is applied shall come into action automatically on remote unit.

Failure of execution of any of the functions mentioned above on remote unit shall be clearly indicated in the master unit.

6.2.5 Automatic brakes:

Extent of drop in air brake pressure in case of air-braked train, when brakes are applied from lead unit, shall be repeated on remote unit and the actual level of braking taking place on remote unit shall be transmitted to the master unit through indicators. The readings on the airflow indicator of remote unit shall be transmitted back to master unit.

6.2.6 Locomotive independent brakes:

It shall be possible to apply and release brakes on remote unit when actuated from the master unit and maintain any desired level of pressure in the brake cylinders between minimum and maximum in remote unit, depending upon the brake valve handle position. It shall also be possible to release locomotive brakes in remote unit keeping the train brakes 'ON' after automatic application when the driver desires it.

6.2.7 Automatic Emergency Brake System:

Automatic emergency brake shall be enabled only on the master locomotive. All remote locos shall follow operation of the auto-emergency brake application on the master locomotive.

6.2.8 Wheel slip:

It shall be possible to provide automatic sanding in case of wheel slip on remote unit without any action by the driver on the master unit. When automatic sanding is taking place on the remote unit, indication shall come on the master unit.

6.2.9 Sanding:

In case, sanding switch is operated from the master unit, it shall be possible to operate sanding gear on the remote unit automatically with its indication being displayed on master unit. Locomotive shall sand only in the direction of travel, even during emergency sanding. There shall not be any sanding whenever the locomotive is in standstill position. Furthermore, if the locomotive is moving and the reverser handle is centered, all four sanding valves shall sand.

6.2.10 Override control:

It shall be possible to over-ride the controls of remote unit when so desired by the master unit driver or in case of discontinuity or loss of communication between master and remote units or when the master unit driver feels that he can operate the train with master unit only.

6.2.11 MU Operation:

For train operation, it may be necessary to have single locomotive as master unit, or number of locomotives in MU. Similarly in remote unit also, the consist may be of single locomotive or number of locomotives in MU. With the setting of master unit control for MU operation, all control commands sent by master control unit shall be transmitted to the remote unit for similar functions and these functions shall be repeated / executed in remote unit. In addition, provision shall exist for independent control of remote unit consists from master unit in case of failure of master unit.

6.2.12 Tractive effort limiting:

Manual TE limiting switch has been provided to enable the operator to limit the tractive effort, to avoid putting stress on weak bridges whenever the locomotive is traversing them. The position of this switch shall indicate that the TE limiting feature has been turned ON.

The tractive effort limit shall be enabled / disabled on the remote locomotives at the same time, whenever this feature is initialized / removed from the master locomotive.

6.2.13 Automatic Switching on of Flasher Light

The flasher lights shall be applied automatically whenever emergency / penalty brake application takes place, as indicated by the loss of PCS. The remote locomotives shall also go to idle mode in the eventuality of master locomotive going to Idle through automatic switching on of flasher light. The flasher on the master loco can be still turned on manually so that if the operator has an emergency that did not drop PCS, the flashers can still be activated.

6.2.14 Operation of vigilance control device (VCD)

The VCD shall be enabled on the locomotive in which the DPCS is configured as master. It shall be disabled on all other locomotives. In case of initiation of penalty brake cycle, the master DPCS shall instruct the remote units to follow initiate penalty brake, reduce power to zero and bring the locomotive to idle.

This condition shall be retained till the VCD is reset on the master locomotive and same is relayed to the remotes.

6.2.15 Operation of Anti collision device (ACD)

The DPCS shall check and ensure that the ACD (where provided) be operational on the master locomotive and disabled on all other locomotives on the train.

6.2.16 Alerts & Alarms:

Arrangement shall be provided for indicating to the master unit operator the status of remote unit in case of any errors, alerts or alarm condition.

6.3 Operational Safety Features

6.3.1 Loss of Communication

Loss of RF communication shall be identified and appropriate action shall be taken by the system to:

- Alert the operator at the master unit. Loss of communications message shall also be flashed on remote units.
- Bring the system and train into safe condition on prolonged communication loss.

All equipment manufacturers shall implement their own strategies; however these shall be approved by RDSO before use.

An instruction sheet is provided as **Annexure 1** of this document describing the communication loss and its handling. This is provided for as a guideline only.

6.3.2 Unintended loss of BP pressure or BP air flow

In case unintentional loss of BP pressure or change of BP air flow is sensed more than the datum level set during pairing, this shall be treated as emergency condition and in such circumstances the throttle shall be reduced to zero and remotes shall stop active control of BP. Brake application made by the operator on the master locomotive shall be repeated on the remotes.

The quantum of change on BP pressure / air flow that shall trigger this change shall be user settable. However the following table indicates the default values and the range for user adjustment.

Parameter	Default change value for trigger	Range of user setting
BP Pressure	0.2 kg/cm ² from the datum values at pairing	0.1 to 0.5 kg/cm ²
BP Air Flow	50% enhancement from datum values	30% to 70% of datum values

Table 2: Trigger values and user settable range for BP parameters

6.3.3 Break-in-two protection

In case of unintentional separation of the train, the remote unit equipment shall assist to prevent collision between the parted portions.

If break-in-two occurs and the driver makes emergency brake application on the master unit, this emergency condition shall be sensed and transmitted to the remote unit where similar brake application shall automatically take place.

6.3.4 Fire in remote unit

In case of any fire taking place in the remote unit, indication to the master unit driver shall be provided with an alarm.

6.3.5 Fail Safe Feature

The equipment shall have fail-safe feature where in case of a system failure, the system goes to SAFE MODE so as not to cause any damage to any equipment controlled by it. The system shall preferably have built-in feature to ensure that in case of failure of a component, locomotive operation, if feasible, is either not affected at all or downgraded only in such a manner that the locomotive is able to complete the trip safely. Addition of considerable hardware or other complications in hardware / software, however, for incorporating this feature are not desirable.

6.3.6 Self test

The system shall be able to run a self-test at power ON or at driver's request to verify satisfactory functioning of all component system including I/O. During operation, the system shall be capable of identifying internal faults as may occur from time to time and their indication to the driver. Fault recovery capabilities and limited fault tolerance are desirable details, which shall be indicated in the offer for evaluation of the system.

7 Technical requirements

The detailed technical requirement is available with the relevant part of the specification however general technical information is as illustrated below

8 Applicable drawings

Applicable drawings, if any, for each component of DPCS 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.

- IEEE 802.3 10baseT 100base Tx M12 D-Coding
- AAR S-5702 for environmental conditions.
- IEC 60297 for 19" equipment rack.
- IEC 60571 for design and manufacture guidelines.
- IEC 60812 for Failure Modes Effect and Criticality Analysis.

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.

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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 / Warranty

The IRS conditions for guarantee / warranty 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.

Details / design/documents given by them are not infringing any IPR and they are responsible in absolute and full measure instead of railways for any such violations. Data, specifications and other IP as generated out of interaction with railways shall not be unilaterally used without the consent of RDSO and right of Railways / RDSO on such IP is acceptable to them.

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

This document and its contents are the property of M/s XYZ(Name of the vendor) or its subsidiaries. This document contains confidential proprietary information. The reproduction, distribution, utilization or the communication of this document or any part thereof, without express authorization is strictly prohibited. Offenders shall be held liable for the payment of damages. Indian Railways/RDSO is granted right to use, copy and distribute this document for the use of inspection, operation, maintenance and repair etc.

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: Handling Loss of Communication



Note: The data provided in this annexure are solely for the purpose of guidance. Equipment manufacturers shall implement suitable and fail safe procedures for handling communication loss.

Overview of communication loss handling

The overall process of handling loss of communication is summarized below:

1. Incase of no communication for 10 seconds, loss of communication is identified.
 - 1.1. Master DPCS shall declare a communication loss and alert operator. Loss of communication to continue till recovered or DPCS disabled / restarted.
 - 1.2. DPCS master shall try to contact remote via trackside devices (where available) for the next 10 seconds
 - 1.2.1.If communication restored it shall revert to normal
 - 1.3. Remote continues in same mode for another 10 seconds and during this period the following shall apply.
 - 1.3.1.Communication loss is indicated on the HMI.
 - 1.3.2.If communication restored it shall revert to normal
 - 1.3.3.If in braking
 - 1.3.3.1. Remote shall gradually cutout brake pipe control, close feed valve and prevent BP charging.
 - 1.3.4.If in motoring it shall continue on same level and watch air flow
 - 1.3.4.1. If BP air flow is sensed
 - 1.3.4.1.1. Remote shall idle down
 - 1.3.4.1.2. Remote shall cut out brake pipe control and close feed valve and prevent BP charging
 - 1.3.5.If in DB, it stays in DB
 - 1.4. After 10 seconds, remote to continue in resultant mode for another 45 seconds
 - 1.4.1. If communication restored it reverts to normal
 - 1.4.2. Motoring to continue on same level and air flow is watched.
 - 1.4.2.1. If BP air flow is sensed
 - 1.4.2.1.1. Remote idles down
 - 1.5. At the end of 45 seconds
 - 1.5.1.Remote loco idles down
 - 1.5.2.If in DB remote loco shall gradually idle down and remove DB.
 - 1.5.3.It waits forever to restore communication or manual intervention on the HMI.

Note: The timing intervals listed above of 10 – 10 – 45 seconds shall be user settable.