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TRACTION INSTALLATION DIRECTORATE



**GOVERNMENT OF INDIA,
MINISTRY OF RAILWAYS**

Instruction No. TI/IN/0021 (01/2010)

**Instructions for increasing data transfer speed of the
traction SCADA system on IR
from 600/1200 bps to minimum 9600 bps**

Jan' 2010

ISSUED BY

**Traction Installation Directorate
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1.0 Scope: This instruction stipulates the action to be taken by Zonal Railways for modification of existing low speed (600/1200 bps) data transfer communication system to high speed data transfer communication system capable of achieving minimum 9600 bps. Railways may plan this work in consultation with S&T department.

2.0 Background: At present ITU-T V-23 half duplex, multi-drop FSK modems are used at RCC and remote posts i.e. RTU. The data transfer takes place at 600/1200 bps speed and due to slow speed of communication, Railways face following problems.

- Time taken for up-dation is quite high especially when no. of retries is needed due to noisy communication channel.
- The analogue signal on copper wires between station hut and RTU-modem is affected by EMI.
- Due to slow speed, some features such as Auto Fault Localization (AFLN) are not in function.
- With modern numerical relays available, SCADA system can be interfaced with protection relays to obtain fault data like impedance values, voltage & current waveforms however higher data transfer speed is required.
- Updating of the information available in field e.g. current, voltage, power, energy & PF etc to RCC at faster rate can provide better analysis of data.

3.0 Development of High Speed Data Transfer Communication System (HSDTCS):

To overcome the above problems, RDSO designed and developed a new communication scheme in consultation with S&T department. The main objectives of new communication scheme were to.

- i. To achieve minimum 9600 bps data transfer rate.
- ii. Avoid multiple conversion of signal from A to D and then D to A thereby reducing chances of noise generation.
- iii. Digital data transmission from RCC to RTUs thereby reducing chances of EMI substantially.
- iv. V-23 modems are now slowly getting obsolete so alternate development was considered necessary.

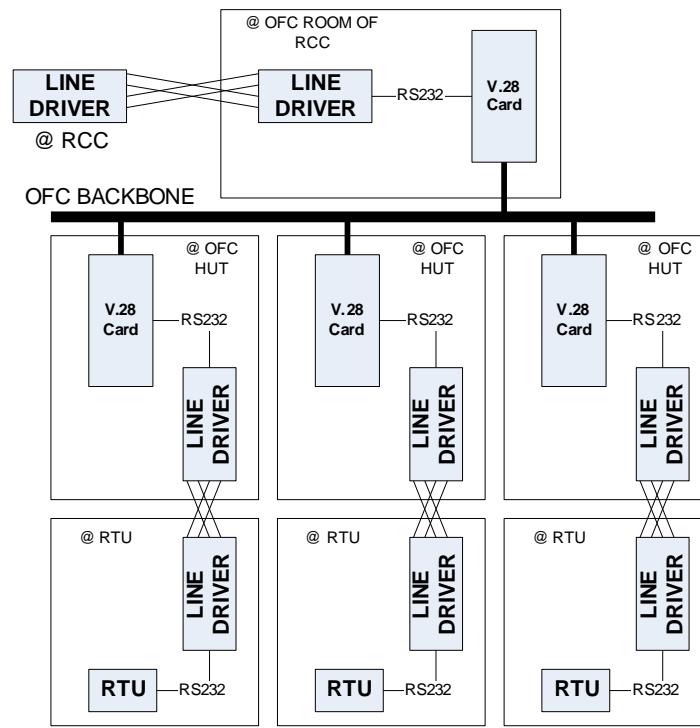
The trials as per this new scheme have now been conducted successfully in Ambala Division of NR after which a report No. TI/REPORT/00077 (02/2009) on HSDTCS was prepared and same has been accepted by Railway Board vide letter No. 2006/Elect(G)/170/2 dated 13.05.2009.

4.0 Communication Setup

The communication setup for implementing high-speed communication was achieved through the use of line drivers/ digital short haul modems and V.28 cards (slow speed data interface as per IRS-TC-68). The V.28 cards are installed in the MUX units of S&T department. These cards provide RS232 signal interface, which is then connected to the line driver installed alongside the OFC equipment. The line drivers enable RS232 communication over distances of up to 4 -5 kms depending upon the condition of cables. Another line driver installed at RTU location receives these signals and converts it back to RS232 signal levels, which is then connected to the RTU.

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The arrangement of new communication scheme is depicted below.



5.0 Implementation of the new communication scheme-Steps to be taken by Railways

- 5.1 The work of increasing the data transfer rates as per this instructions may be got done only from RDSO approved sources of SCADA system or from OEMs.
- 5.2 Although all new PC based SCADA systems as per RDSO specification No. TI/SPC/RCC/SCADA/0990 supports operation at higher data transfer rates with changes in settings & configurations however, Railways shall have to confirm from SCADA OEM that their system software at RCC and RTU firmware and hardware supports data transfer rate of 9.6 kbps through serial data port.
- 5.3 Obtain the make/ type of MUX equipment at RCC end and at station huts from S&T department. Check availability of V-28/ slow speed data interface cards in the MUX as per IRS/TC-68 and plan quantities accordingly.
- 5.4 Railways shall confirm from S & T department that vacant slot is available for providing V-28 cards in the MUX equipment at headquarter and all station huts.

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- 5.5 Railways shall have to mention the following technical details while preparing specifications for the work.
- 5.5.1 Technical details of MUX equipment at both headquarter (RCC) and station huts to be provided by S&T department.
 - 5.5.2 Make/ type and quantities of V-28 (slow speed data interface as per IRS-TC-68) cards required if not provided in MUX.
 - 5.5.3 The distance of each post from the station hut to decide the correct line drivers or short haul modem.
 - 5.5.4 The available ac and dc supply voltage levels at station huts, RTU and RCC for selection of suitable line driver/ short haul modem.
- 5.6 RDSO had conducted trials by using line drivers operating at 240 V ac (use of UPS was made to prevent interruptions in trial) for both at RCC and at station huts however it is recommended to select line drivers / short haul modems suitable for working at 48 V dc for station huts and RTUs while in RCC and at head quarter MUX 240 V ac operated units may be used.
- 5.7 If the operating voltage of line driver/ short haul modem is different than the available dc supply at any place then suitable dc-dc converters should be included in the scope.
- 5.8 The successful implementation of the scheme shall depend on the quality of line drivers/ short haul modems hence it shall be mentioned in the work specification that overall performance of the system including all sub-components like line drivers/short haul modems shall be of the vendor undertaking the work of up-gradation.
- 5.9 Railways shall also include a clause for warranty and AMC for a minimum period of 1 & 2 years respectively covering the all up graded system components.
- 5.10 The methodology of switching over from existing communication channel to the new channel should be decided in consultation with the vendor and local conditions and it is advisable to switchover in gradual manner.
- 5.11 All other general terms condition of contracts may be decided by Railways as per the extant rules.
- 5.12 The work content shall be for erection, testing, commissioning of the new communication channel in association with Railways engineers including measurement of dB levels, noise and data capture using software tools as part of system integration.
- 5.13 It is recommended that Railways shall keep provision of spare V-28 cards and line drivers/ modems to avoid any delay in restoration of the system.

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5.14 The work shall include that, on completion, vendor shall provide time calculations to find out the overall improvement in the system performance. In addition vendor shall also jointly verify the increase in data transfer speed by using oscilloscope. It may however be noted that there will not be a direct relation in terms of improvement in data transfer speed of the system and update times because of line driver/short haul modem turnaround times.

6.0 Modifications at RCC and RTU level may include

6.1 RCC Level

The SCADA system at RCC may have to be modified to include another communication channel. For this purpose, the existing communication processors at RCC may be augmented with additional RS232 ports. The SCADA software shall then have to be reconfigured, with the RTUs to communicate on the new line over SPORT protocol, operating at 9600 baud.

6.2 RTUs Level

The configuration of the existing RTUs at each location shall have to be modified to run over SPORT protocol and at 9600 baud rate. The existing modems will be replaced with line drivers as shown in above figure.

All the changes in the RTU wiring done by the vendor shall be by using standard wiring practices and circuit diagrams shall be provided to the Railways.

7.0 The trials were conducted by RDSO as a project for 3 posts of Ambala division and RDSO specification for this trial, copy of LOA, joint performance report , photographs of the trial and technical details of the equipment is enclosed herewith as Annexure-I to V for reference purpose.