Iskratel InfoCommunication Solutions for Railways

RINS
(Railways Information and
Notification System)

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Content

1 Introduction

The document contains information about Iskratel RINS system. Denomination »SI3000 RINS« stands as »*SI3000 Railways Information and Notification System*«.

The Iskratel RINS solution provides railway operators a reliable information and notification system for their railway passengers and personnel. One solution assures audio and video distribution of any type of information to any location. One integrated solution, replaces many separated systems

It fulfills demanding requirements in modern railways transportation and and ensures content management, distribution and reproduction of audio and video information with high reliability and availability, along with comfortable use and a full overview of the whole situation.
It provides different kind of information to different target groups:
- general travel information (exact time, departures and arrivals, expected delays, gate numbers, etc.),
- safety information in cases of emergency,
- advertisements and
- service messages for the operator's personnel.

Solution connects to data technologies and integrates audio/video technology which enables high grade of functionality and is intended for use in both, indoor and outdoor conditions.

Build from set of modules which offer management and control over the system, it enables distribution of audio/video information towards the users.

The Iskratel RINS solution can be implemented in many different configurations as a standalone solution or as a part of the overall railways InfoCommunication solution. This document presents partial presentation of the whole solution.

The solution is adaptable and customizable to detailed customers' requirements. For that reason only few examples of configurations are presented.

2 SI3000 RINS (Iskratel Railways Information and Notification System)

2.1 Background

Accurate informing of passengers and personnel about general events (e.g. train arrivals, dangers…) is one of the crucial points of a modern nerve point such as railway stations. The goal of every transportation company is to enable powerful alarm and event handling as well as the priority levels of live notifications, messages, pre-recorded alarming via messages and external audio announcements or signals.

2.2 Briefly about RINS

Iskratel RINS offers high availability with fully redundant configurations, while being a central server driven solution. RINS can be either as a stand-alone solution or integrated as a crucial part of operational and technological communications in railways telecommunications systems.

In addition to the reproduction of VoIP audio streams, the intelligent client can also control alarms, priorities and covers the diagnostics of the full audio path followed by triggering redundancy systems in 1+1 or N+ 1 configurations.

Informing is divided in zones, where each zone is controlled with its own intelligent client and modular amplifiers. Virtually unlimited number of properly powered zones is available with possibility of reproducing dedicated audio information simultaneously to every zone.

Intelligent client controller ensures automatic adjustment of transmission volume according to the environmental conditions.

For noisy environments solution uses SIP-controlled intercom stations with option of additional self-powered speakers to insure loud and clear announcements.

Digital Acoustic echo eliminator and powerful noise-cancelling algorithms enable hands free intercom use with full duplex operation even at more than 100 dB ambient noise level.

Video information is distributed via IP network through standard client PC and dedicated players. Each content block demands a single player. Video signal from the player can be distributed via standard Cat5 cable through video-splitters/extenders up to several hundred meters away to multiple displays.

3 RINS architecture

RINS solution architecture can be divided into four basic areas:

- Communication platform
- Information and Notification management,
- Audio information delivery systems,
- Video information delivery systems;

The solution is based on Iskratel standard and dedicated modules:

- SI3000 cCS – Compact Call Server,
- Si3000 ES - Ethernet Switches,
- SI3000 MN – Management Node,
- SI3000 FMS – Fault Management System,
- SI3000 MPS – Modular Power Supply,
- SI3000 RINS Server.

The system comprises of large set of user terminals:

- SI3000 MPD for RINS – Multi Purpose Dispatcher for RINS
- Analog phone terminals – standard terminals can be used,
- DECT phone terminals – standard terminals can be used,
- ISDN phone terminals - standard terminals can be used, dedicated Iskratel terminals are to be used for special purposes,
- IP phone terminals – standard terminals can be used, dedicated Iskratel terminals are to be used for special purposes,
- Fax systems…

A large set of output devices is integrated in the system:

- Intercom systems,
- Audio systems, (loudspeakers)
- Video systems (LCD monitors and LED displays)

System enables wide use of standard equipment. System can be also customized for other specific types of equipment, based on customer requirements.
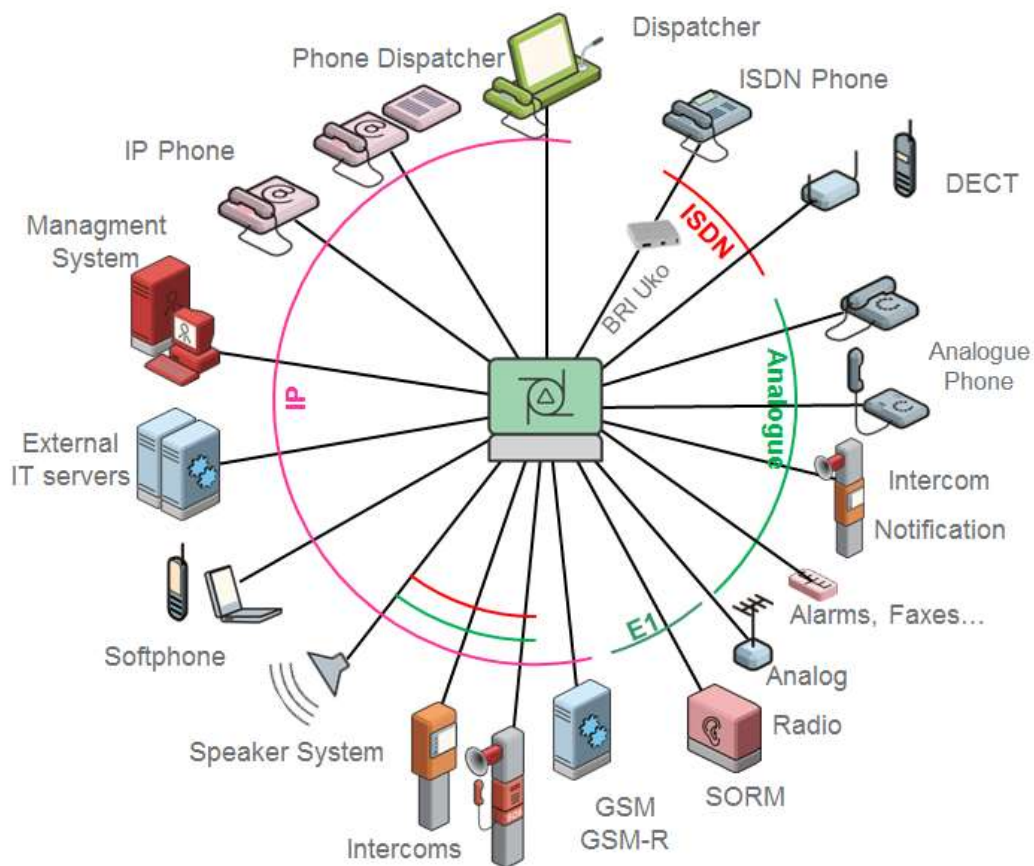
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Figure 1: Iskratel RINS as a part of whole solution for railways

3.1 Communication platform

Communication platform of RINS enables connectivity within telecommunication environment.

3.1.1 SI3000 cCS – compact Call Server

SI3000 cCS provides several application options and can be used in the network as:

- Switch-access node or telephone exchange which enables connectivity to subscribers and access and service nodes.
- IP gateway that includes signaling and media gateway for the conversion of TDM signaling and media traffic to IP and vice versa.
- A service node with the option of connecting additional application servers for voice-enabled, call and other services.
- Point of interaction with the environment through I/O ports.
- A converged notification server through peripheral interface (PIA blade) towards equipment for audio content distribution.
- A multifunctional node that enables the combination of the above-listed functionalities.

3.1.2 SI3000 MN – Management Node

SI3000 MN is managing all Iskratel RINS equipment. CtrlSrv application on application server (SI3000 AS) is managing the dispatcher terminals.

3.1.3 SI3000 FMS – Fault Management System

SI3000 FMS is managing reports of the entire RINS system, gathering and presenting them in an interactive way, showing exact place of fault on pre-defined and specified location maps.

3.1.4 SI3000 MPD for RINS – Multi Purpose dispatcher for RINS

The same type of professional working place as for operative dispatchers is foreseen also for RINS dispatcher/ operator. For more effective work additional modules like secondary LCD monitor, keyboard and mouse can be added.

Role management assures redundancy between dispatchers. In case of failure of any SI3000 MPD the active and waiting calls are transferred to another dispatcher which takes over the role.

Dispatcher terminals are compact based industrial PC without moving parts, passive cooling and touchscreen LCD monitor. The speaker and microphone combination can be separated from compact housing for easier positioning and placement on the workplace.

Figure 2: MPD for RINS with handset and speakerbox with gooseneck microphone

The size of the basic configuration of the terminal is: (including side covers): 409 x 343 x 109 mm

MPD has special features which enable better usage, easier handling, efficiency and extends the life of the equipment itself:
- Bright display adjustable to any lighting conditions.
- Resistive touch screen monitor:
  - Can be used with any mechanical element not just fingers.
- Two Ethernet ports

- Can be used for separation of traffic to two VLANs or redundant connection to network.
- Pedal for PTT (Push To Talk) function
- Additional modules for expansion of the terminal:
  - Keyboards with direct call keys,
  - LCD monitor, alphanumeric keyboard, mouse.

3.1.5 Other components used in solution

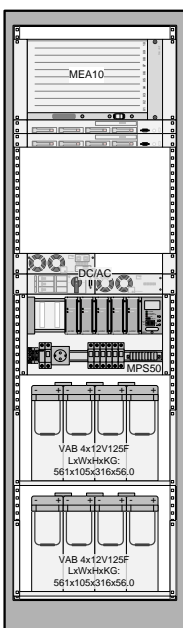- SI3000 Ethernet Switch,
- Layer 2 switches,
- SI3000 MPS;

Figure 3: Mounting of equipment in the cabinet (with RINS server)

3.2 RINS Server

RINS server pulls actual information from the central server. It generates **audio** announcements from **pre-recorded** fragments and **video** contents (arrival/departure time table) for presentation on stations along the railway lines. Operator can also emit manually live audio announcements e.g. in cases of emergency situations. It also enables **central recording** of all emitted audio announcements.

RINS Server is a powerful application realized on Iskratel's Application Server platform. Together with the other equipment it informs passengers about time schedule of train arrival, departure and routing. Informing consists of:

- **Audio announcements** over the loudspeakers in pre-defined zones/railway stations.
- **Video notifications** on the video screens positioned on railway stations and platforms.

RINS Server automatically generates audio and video notifications based on:
- Railway topology (stations, platforms, railway tracks, video (WEB) nodes, audio nodes),
- Railway time-table or/and IUS telegram events (in step2a),
- Scenario rules for each train passage over railway station.

RINS Server provides WEB portal for **RINS dispatchers** which can:
- Monitor WEB/audio nodes,
- Manipulate notifications.

RINS Server provides WEB portal for **RINS operator** which can:
- Administration of RINS dispatcher users,
- Provide topology administration,
- Scenario/templates/fragments handling,
- RINS server parameters administration.

The whole realization of passenger information functionality consists from the following items:
- RINS dispatchers users administration,
- RINS dispatchers login authorization and role management,
- Railway topology provisioning,
- Device topology provisioning,
- Processing of:
  o a railway time-table events and/or,
  o IUS events;
- Time zone control,
- Importing of pre-recorded voice fragments,
- Automatic generation of notification events (video/audio),
- Manipulation with notification events by RINS dispatcher (video/audio),
- Recording of new audio notifications/fragments (by RINS dispatcher),
- Audio notification internal playing (on RINS dispatcher),
- Monitoring of video information on all stations (on RINS dispatcher),
- Monitoring of audio information on all stations (on RINS dispatcher),
- Playing of audio notifications,
- Playing of video notifications,
- System diagnostics,
- Licensing,
- Logging,
- Archiving,
- Localization,
- Deployment.

3.2.1 RINS Server Management

RINS Server Management enables:
- Configuration of the system and users,
- Device topology provisioning,
- Processing of timetable events,
- Configuring of voice fragments,
- RINS scenario configuration,
- Notification templates preparation,
- Diagnostics overview...

Additional RINS information can be visible on the secondary LCD monitor on dispatcher's workplace for better efficiency.
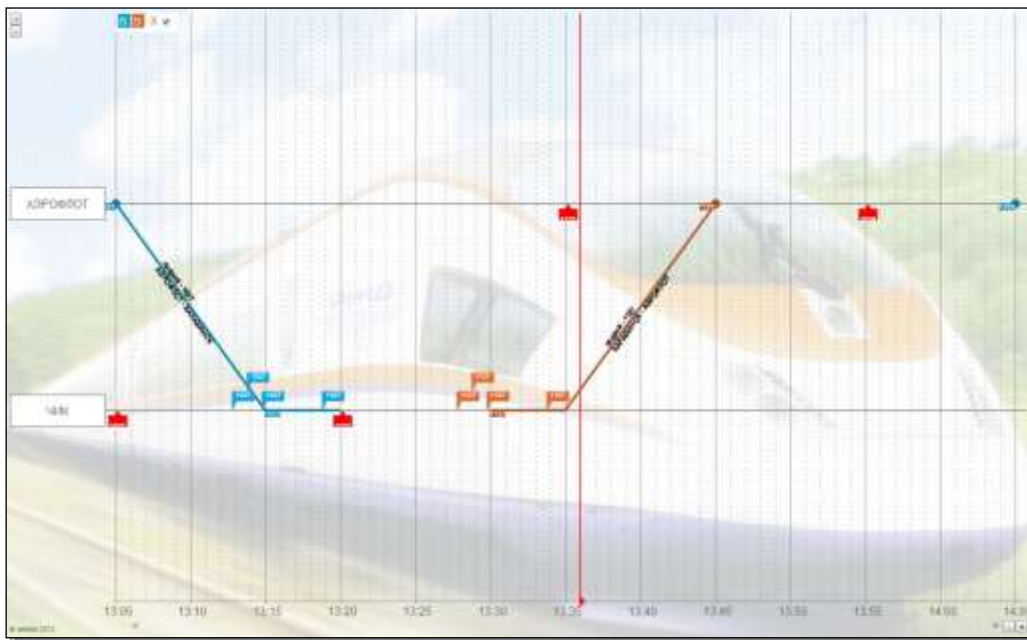
Figure 4: GUI of trains crossing and played information
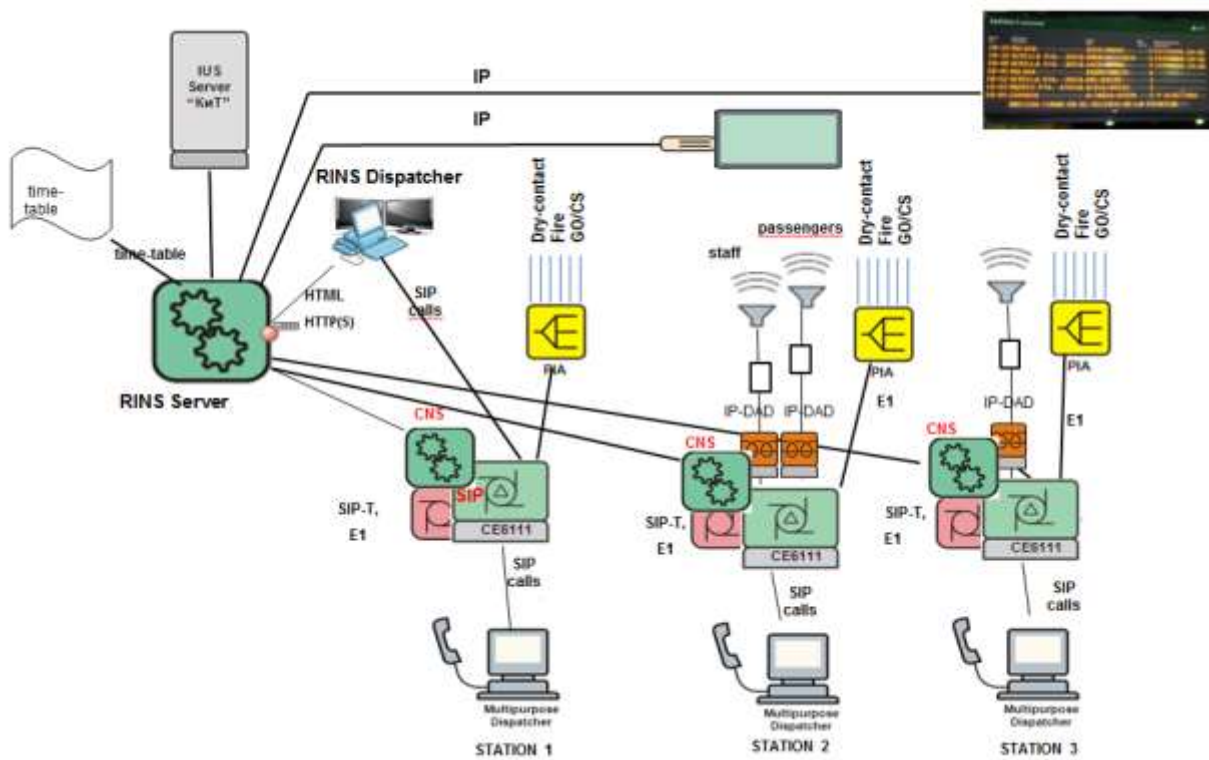
3.3 RINS Interfaces

Figure 5: RINS components in network

Communication within the RINS system is realized through different communication protocols

Interface RINS Server ←→ CNS

VoiceXML interface is intended for voice fragments delivery.
SOAP interface is intended for:
- collect audio destinations list on RINS Server,
- pass the requests for audio announcements playing,
- collect/retrieve the playing status of announcements.

Interface RINS Server ←→ RINS operator

HTTP(S) user interface based on WEB platform.

Interface RINS Server ←→ Video displays

- HTML 5 technologies assure interoperability with wide range of video LCD monitors.
- LINARIA protocol is used in countrywide systems and providing both-sided information between RINS server and LED displays.

Interface RINS Server ←→ IUS "telegram" event server (Russian Railways specific)

Interface to IUS server, which provides events on base of time-tables and realistic events from railway (a sort of train locating). Pairing should be done with the interface Ethernet IEEE 802.3, using the network layer protocol IP, RFC 791, and TCP transport protocol.

RINS server can be customized to any other user specific event server protocols.

4 Audio information delivery system

Audio distribution is intended for:
- Delivery of **audio** information to the passengers and railways personnel - actual events (departures, arrivals, train crossings) for passengers and critical information for providing safe working conditions,
- Delivery of **audio** information to the enterprise networks, energetics, etc. - mainly for distributing of live announcements, alarm messages and also background music.

For high availability, audio distribution system can be configured as redundant in several stages:
- With A+B redundancy where:
    - Failure of one Audio-decoder has no affect to announcements.
    - Failure of one amplifier partially reduce the audibility (up to 6dB max), but it is still provided through other line of speaker.
    - In the zones with high ambient noise speakers can be combined with flashing beacons.
- With N+1 redundancy where switchover to redundant unit based on real-time diagnostics is realized:
    - On IP network level via SIP routing.
    - On audio signal level via low-power relay contacts.

o On 100V outputs from amplifiers via power relay contacts.

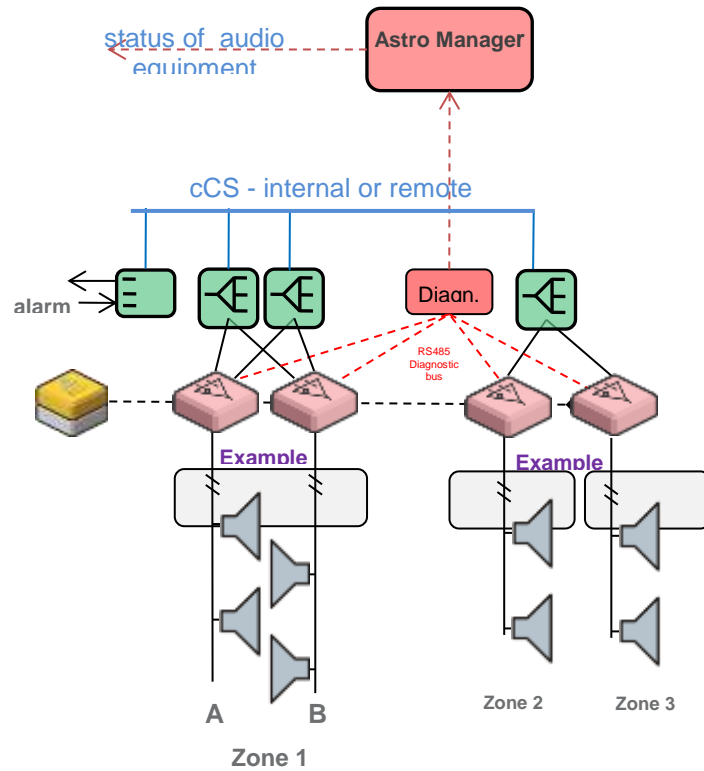HD quality of voice is assured by Iskratel's Peripheral Interface blade (PIA blade) for IP/analog conversion.

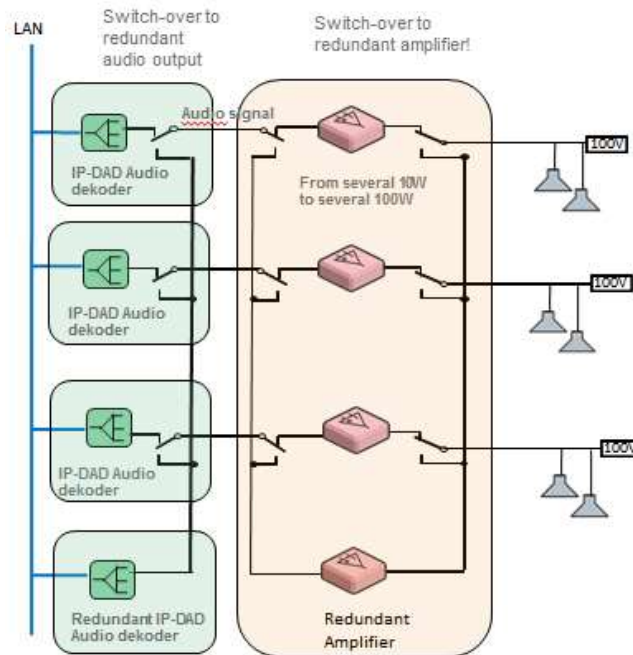**Figure 6: A+B redundant audio information system configuration (in Zone 1)**

Figure 7: N+1 redundant audio information system configuration

Large set of modular, industry grade amplifiers from 60W to 500W is implemented. Its main features are:
- High efficiency Class D amplifiers,
- Mains voltage (230 VAC) and 24VDC operation,
- Two audio inputs, primary input with priority and double socket for parallel connection of several amplifiers,
- Forced fan-cooling with electronic control and protection circuit,
- Front panel signaling of overloads and thermal protection,
- RS-485 output for communication with AstroManager for the control of all amplifier functions and line fault detection,
- Comply with EN-60849 standard for PAGA equipment.

Figure 8: Modular audio amplifiers

Different types of speakers are introduced to fulfill all customers' need:

- **Indoor**
    - Wall,
    - Ceiling,
    - Cabinet,
    - Wall volume regulators with bridging relay.

- **Outdoor**
    - Weather-proof (IP56 – IP67),
    - Explosion-proof,
    - Horns from metal or composite (plastic),
    - Passive speakers for connection to 100V line,
    - Active speakers:
        - With built in amplifier only,
        - With built in amplifier and volume regulation regarding to the environment noise.

Speakers can be mounted based on customers need so the sound waves spread uninterruptedly and smoothly on the desired height on the platform.
For zones with high ambient noise sound level can be adjustment, so the sound reproduction is depending on the ambient noise. Also speakers can be combined with flashing beacons.

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5 Video information notification system

Iskratel offers a numerous Passenger Information Displays for Railway Stations, Bus and Tram Terminals. The product range includes main station signs as well as platform displays. Displays are designed to meet demanding environmental conditions for outdoor applications as well as for semi-outdoor and indoor applications.

Displays are designed to operate 24/7 and are equipped with built-in diagnostic system. Sensors within the casing enable monitoring the health of display and can be reported back through the system.

5.1 LED displays

LED displays are economical solution for applications where only text is required. The latest LED technology provides smart and highly versatile displays with excellent readability. Semi-outdoor and Indoor LED displays are composed of lower mechanical protection and provide information with lower luminosity and a wider viewing angle. Generally Outdoor Displays are composed of higher mechanical protection and provide information to passengers with higher luminosity and decreased viewing angle. Anti-vandal glass of LED displays guarantees safety of the equipment in public environments while the extendable front frame allows easy maintenance.

5.2 TFT LCD monitors

Iskratel provides three general types of TFT LCD monitors:
- Indoor,
- Semi-outdoor,
- Full-outdoor.

Indoor systems are made for safe room temperature areas not compromised by outdoor environment effects such as heat, cold, temperature fluctuation, dust, dirt, pollution, humidity, condensation, solar radiation, high ambient light and vandalism.

Semi-outdoor monitors are ideal for places that do not receive direct sun light or that are protected by a roof or awning.

Full-Outdoor LCD monitors are designed to be readable and to operate efficiently under full sunlight conditions without the adverse effects of solar loading on the LCD panel and are able to continually operate at a minimum of 1.500nits in bright sunlight with as high as possible contrast levels.

Additionally outdoor LCD monitors can be IP65 or IP54 to protect electronic components from dust and water. The temperature is maintained (heating & cooling) within the casing to provide optimum operations from 20°C to +40°C. If required additional heating elements can be added. The embedded PC Ethernet connectivity means that the outdoor monitors can be deployed in many more outdoor environments.

5.3 Main station displays

Main station displays are used to show accurate information on arrival and /or departure times of public transport services, making it convenient for a large number of passengers looking for information simultaneously. These types of displays are most typically single-sided, mounted on a wall and used in indoor or semi-outdoor applications. Main station displays could be provided in LED technology where due to the character height and excellent optical characteristics the data can be read at great viewing angles and long distances, or in LCD technology in fully graphical mode, where also other options of video content are possible.

Main station LED displays

- Display of information on 10 or more lines (depending on customer demands),
- Display of 48 or more characters in each line (depending on customer demands),
- Luminance more than 2.500 cd/m²,
- Possible effects of displayed contents: static, scrolling in all directions, blinking,
- 64 mm or 80 mm character height,
- IP33 or IP55 housing for ambient temperature from -40 °C to +55 °C.

Main station LCD monitors

Indoor version

- Could be provided in 32'', 42", 55" and 70" panel size and 1920 x 1080 resolution,
- Integrated PC unit with Core i3, i5, i7 and Windows Embedded operating system,
- Right and correct integration between the display and the controller, by means of a LVDS direct integrated connection,
- Dedicated special mechanical structure, the majority of parts of the displays are on site interchangeable without need to remove the display from its installation anymore, avoiding swapping and need the part back to service.

Semi-Outdoor version

- Could be provided in 32'' or 42" panel size and 1920 x 1080 resolution,
- Integrated LVDS panel drive for embedded PC,
- 500 cd/m^2 brightness with 4.000:1 contrast ratio and 178° viewing angle,
- 6 mm harden and laminated glass with anti-vandal protective glass,
- IK-08 Housing protection with IP54 or IP65,
- Operating temperature range for display is from -15°C to +45°C.

Full-Outdoor version

- G-Bond technology and sunlight readability,
- Displays are available in fully ruggedized, anti-vandal and weatherproof casings,
- Luminance of white: 1.500cd/m2 (Typical),
- 32", 46", 65" sizes available,
- Proprietary Thermal Management System,
- Backlight control via ambient light sensor,
- Anti-reflective, anti-vandal toughened or laminated glass,
- Advanced optical enhancement,
- Operating temperature range: -20°C to +45°C (direct sunlight) / -20°C to +50°C (covered)

5.4 Platforms displays

Typical platforms displays show information on 2 or 3 lines, about the vehicles route and destination, minutes to arrival and special event notifications. The platform displays come in several different versions: single-sided, double-sided, multi-line display and could be in LED or LCD technology.

Platform LED displays

- Modular customized design, tailored to your specific requirements,
- Automatically regulated luminance depending on surrounding conditions,
- Possible effects of displayed contents: static, scrolling in all directions, blinking,
- Luminance more than 2.500 cd/m²,
- Minimum 150° viewing angle,
- IP55 housing with antireflective coated Lexan or tempered glass for operating temperature range: -40°C to +55°C.

Platform LCD monitor

- Direct sunlight readable displays with LED backlight system,
- Active area size 37.9", Aspect ratio7:02 with dimensions 930.24 x 243.219mm,
- Luminance of white: 1.000cd/m2 (Typical),
- Panel native resolution is 1920 x 502 pixels,
- IP65 housing with optically bonded 6mm harden glass which could be removed,
- Operating temperature range for display is -25°C to +60°C.

6 References

1. Russian Railways

2. Slovenian Railways

3.   Ukrainian Railways

4.   Kazakhstan Railways

5. Railways Republike Srbske

6. Moldovan Railways

7 Abbreviations

Abbreviation	Meaning
cCS	SI3000 Compact Call Server
CNS	Converged Notification System
DECT	Digital Enhanced Cordless Telecommunications
DTR	Dispatcher Terminal for Railway
ES	SI3000 Ethernet Switches
FMS	SI3000 Fault Management System
GUI	Graphical User Interface
ISDN	Integrated Services for Digital Network
LCD	Liquid-crystal display
LED	Light Emitting Diode
MG	Media Gateway
MN	SI3000 Management Node
MPD	Multi-Purpose Dispatcher
MPR	SI3000 Modular Power Supply
PPT	Push To Talk
RINS	Railways Information and Notification System
SIP	Session Initiation Protocol
SOAP	Simple Object Access Protocol
TFT	Thin Film Transistor
VoIP	Voice over Internet Protocol

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