Tadiran Telematics Proprietary - Commercial Confidential

RSC

Road Side Communicator

Specification

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1 General

The Road Side Communicator (RSC) is a short-range wireless communication unit (base station) handling the communication with the Vehicular units (VTU's). When a vehicle passing by a Road Side Communicator (RSC) the bi-directional communication is done automatically without involvement of the vehicle driver.

After completion of the communication with the vehicle the RSC stores the received (uploaded) data and handles the delivery it to the Control & Report Center/ Data Management Center

The Road Side Communicator (RSC) is designed for external installation in key locations for the fleet operations like gates, warehouse entrance, etc.

2 Applicable Documents

- EIA RS-232-C
- IEC 68-2-3
- FCC Part 15, Subpart C section 15.247
- RSC-VTU protocol Specification: Tadiran-telematics doc
- DH-RSC protocol Specification: Tadiran-telematics doc

3 External Interfaces

The RSC provides for the following types of external interfaces:

a) Serial Ports

The RSC provides two (2) bi-directional asynchronous serial interfaces: COM1 and COM2.

- COM1 is used for the communication with the Data Management Center in direct connection or via modem connection.

  COM1 meets the following definitions:
  Three (3) Wires: TX , RX, GND
  Or: Nine (9) Wires: TX, RX, CTS, RTS, DTR, DSR, DCD, RI, GND
  Levels: RS232-C
  Format: 1 Start bit, 8 Data bits, 1 Stop bit (software configureable)
  Rates: From 4800 Bps up to 115200 Bps (software configured from standard rates list)
  Default rate: 19200 Bps

  The communication protocol with the Data Management Center is based on a standard File Transfer Protocol.

- COM2 is used for RSC initialization and maintenance purposes by using pcAnywhere ™ in direct connection or via modem connection.

  COM2 meets the following definitions:

  Nine (9) Wires: TX, RX, CTS, RTS, DTR, DSR, DCD, RI, GND
  Levels: RS232-C
  Rate: 38400

b) Peripheral systems interfaces (Option)

RSC supports peripheral interface to indicate the beginning and end of the data communication with the VTU such as traffic lights.

This interface is controlled by the LPT port of the RSC controller.

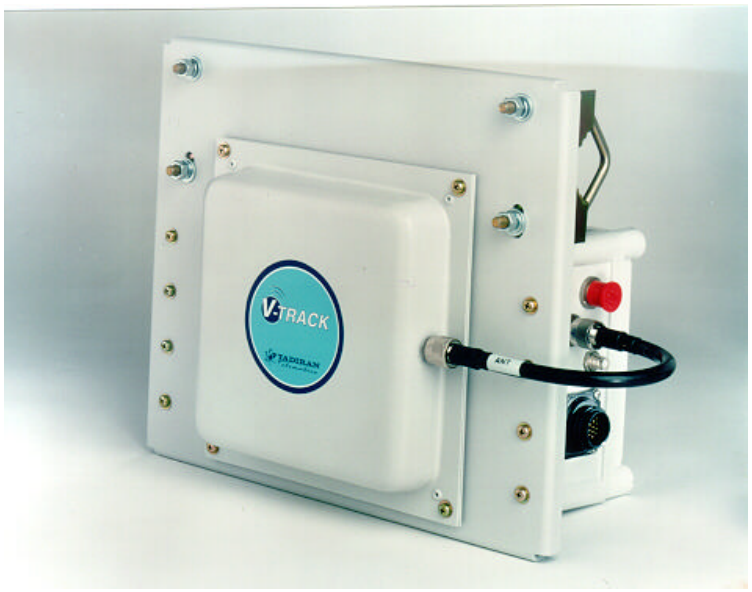
c) DSRC wireless link

The Dedicated Short-Range Communication (DSRC) Transceiver is responsible for the bi-directional wireless link communications with the VTU.
This wireless link is based on a modulated backscattering technique

4 Electrical and Mechanical requirements

4.1 Mechanical Specification

The Road Side Communicator (RSC) is designed for external installation in key locations for the fleet operations like gates, warehouse entrance, etc.



Dimensions:

Width: 440 mm
Length 310 mm
Height: 210 mm

Weight: 7Kgr

The Road Side Communicator (RSC) will be install on a Gate Bar above the center of a road lane in order to “see” the VTU.

The height of the column will be up to 5m.

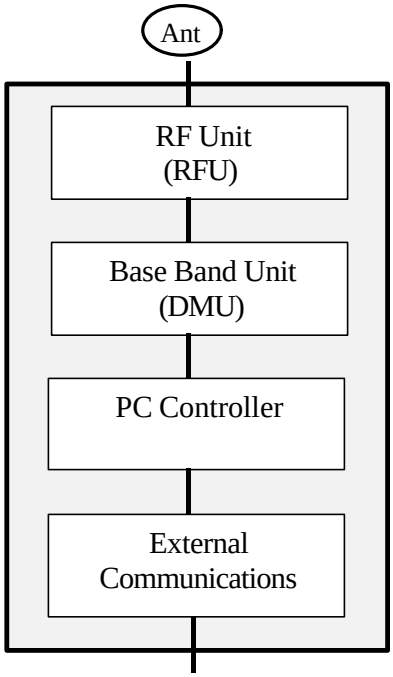
4.2 Electrical Characteristic

The Road Side Communicator (RSC) is a short-range wireless communication unit. The RSC is monitoring for VTU Backscattering RF Signal. The RSC senses When the VTU enters the RSC communication zone and starts the communication with the VTU.
Two major parameters have a significant influence on the automatic data upload Performance: the communication link net data rate and the radiation pattern of the antenna.

After completion of the communication with the vehicle the RSC stores the received (uploaded) data and handles the delivery it to the Data Management Center

The RSC consists of the following major components:

- Controller
- Base Band Unit (MODEM)
- RF Unit
- RF Antenna
- External interfaces
- Power supply



RSC

4.2.1 Controller

RSC Controller Characteristic:

PC standard board

H.D: Diskonchip 72M (M-system).

RAM: 32Mbytes or more.

4.2.2 Base Band Unit (MODEM) - DMU

The DMU manages all the communication with the RF Section.
It handles: bit synchronization, signals modulation, frequencies control, transmission and receiving control.

4.2.3 RF Unit

4.2.3.1 Technology Type

The RSC wireless communication is based on a modulated backscattering technique

4.2.3.2 Frequencies Band

The Frequency band is 904.2 – 925.8MHz

4.2.3.3 Carrier Frequency

Carrier Frequency: Frequency Hopping

- ⇒ 37 Channels
- ⇒ Channels steps of 600 KHz

4.2.3.4 Frequency accuracy

The frequency error is not exceed ±50 ppm.

4.2.3.5 Output Power

The RSC transmission power output level is 21 dbm at temperature of 25± 5º C

4.2.3.6 RX Sensitivity

Input signal @ antenna -66dbm.

4.2.3.7 Modulation Types

ASK , FSK of the sub-carrier

4.2.4 RF Antenna

The RF antenna is an integral part of the RSC.

Gain:	7.5 dbi
VSWR 50Ω	1.5
Horizontal beam width	65°
Vertical beam width	85°
Polarization	horizontal linear

The antenna beam width and the installation have a major influence on the communication performance. As the vehicle passing under the RSC has a longer exposure time, as more data can be uploaded at higher driving speeds.

4.2.5 Power Supply

Power source: The full operational range of the input voltage shall be from 20 to 40 VDC.

Power consumption: 24V/0.85A

5 Functional and Software requirements

The Road Side Communicator handling the communication with the Vehicular units (VTU's).

The RSC will carry out the following main functions:

- Upload the records from the VTU to the RSC
- Program the VTU Parameters.
- Deliver the uploaded data to the Data Management Center

5.1 RSC ID

The RSC will be delivered with a factory programmed ID (RSC_ID).
The RSC_ID will be unique for each RSC.

5.2 Initialization Process

The initialization process includes:

- Reading initialization parameters from the initialization files
- Hardware Initialization
- Built In Test
- Communication with Data Management Center for status report

After the completion of the initialization process the RSC will perform the processes that are defined by the script file.

5.3 Communication processes with VTU

The communication protocol defines the following messages:

- Poll - Polling message (sent by RSC)
- Ack – Acknowledge message (sent by RSC)
- VTU-ID Message – VTU to RSC message (sent by the vehicular unit)
- Read message (sent by RSC)
- VTU Read message (sent by the vehicular unit)
- Write message (sent by RSC)

The communication process between the RSC and the vehicular unit always starts with a POLL message from the RSC to the VTU (containing the ID of the RSC) and ends with an ACK message from the RSC to the VTU.

5.3.1 Polling a message to the VTU

The polling mode is used by the RSC to check if there are any VTU's in its read/write range, the process for polling is:

1. The RSC sends a POLL message
2. The VTU answers with a TRANSPOSE message (Transponder to reader message)
3. The RSC receiving this message answers with an ACK message
4. The VTU receives the ACK message and stops answering.

5.3.2 Writing a message to the VTU

The process of writing a message to a VTU consists of the following steps:

1. The RSC sends a POLL message
2. The VTU receives the message and sends a TRANSPOSE message
3. The RSC receives the message and sends a WRITE MESSAGE to this VTU
4. The VTU receives the message and sends a TRANSPOSE message
5. The RSC receives the message and sends ACK message

5.3.3 Reading a message from the VTU

The process of reading a message from a VTU consists of the following steps:

1. The RSC sends a POLL message
2. The VTU receives the message and sends a TRANSPOSE message
3. The RSC receives the message and sends a READ MESSAGE to this VTU
4. The VTU receives the message and sends a READ TRANSPOSE message
5. The RSC receives the message and sends ACK message

5.3.4 File Transfer

File transfer process consists of a combination of writing and reading messages.

The RSC sends write message with command to upload a file followed by a series of read messages in order to upload the VTU file.

5.4 Script Application

The script application activates series of processes according a predefined order as defined in a script file.

The processes are:

Read massage from VTU

Write message to VTU

File transfer from VTU

The script file defines series of processes and how many times to repeat each one.

5.5 Communication processes with the Data Management Center

The communication process with the Data Management Center supports:

- Transferring the uploaded VTU's files to the Data Management Center
- Transferring status reports and logfiles for maintenance
- Receiving set up commands

The communication protocol with the Data Management Center will take care of situation:

a) No file in the RSC will cause blockage of the communication to the center and prevent the transfer of any file

5.6 Other main software processes

5.6.1 Bit Test

The software will perform a Built-In-Tests (BIT) of DMU and RFU units.

5.6.2 Maintenance Processes

The RSC will perform the following maintenance processes:

- Managing log and status files.
- Delete old backup files in order to keep a minimum disk space for incoming new files
- Send log and status files to data management center.

5.7 Software parameters

The software initial parameters are defined in the following files list:

- **RSCOPERT.INI** – defines RSC-ID and System operational and service parameters.
- **DH_CONN.INI** - define the connection to the Data Management Center.
- **SCRIPT.INI** - defines series of processes for a script application.
- **RSC.INI** - defines RSC internal operational and service parameters.

- **PERIPHRL.INI** - define address connection for I/O card and other parameters for peripheral equipment.
- **SYNT.INI** - defines list of working frequencies.
- **RFPARAMS.INI** - defines RF address and timing parameters for DMU.

6 General Requirements

6.1 Maintainability

The RSC maintenance will be performed at two levels:

Field Level:

Complete Road Side Communicators are removed or installed by technicians servicing the site. Only basic knowledge of the RSC functions is necessary to perform this task.
The average time to replace RSC will less than 30 minutes.

Depot Level:

Complete units will be serviced down to component level at the manufacturer depot. At the depot, each of the faulty modules will be repaired, aligned and tested using lab. equipment.

6.2 Environmental Characteristics

6.2.1 Temperature range

Operating Ambient Temperature: -20°C to +70°C

Testing for 12 hours at minimum temperature and 12 hours at maximum operating temperature.

6.2.2 Humidity

The RSC shall operate in an environment with up to 95% relative humidity, Non-condensing @ 40° C with testing criteria set forth by IEC 68-2-3 for 96 hours.

6.2.3 Splash

The RSC shall meet the splash with the following conditions:

Water splash at 0.25cm/min @ 45° above the unit with a nozzle having a solid cone spray.

Appendix A: RSC - connector

Connector type: BINDER, 24 pin, male connector, mfg p/n: B-0739-00-24

Pinout:

1.	DCD1	- Com1- DCD or LAN connection (optional)
2.	DSR1	- Com1- DSR or LAN connection (optional)
3.	RTS1	- Com1- RTS or LAN connection (optional)
4.	CTS1	- Com1- CTS or LAN connection (optional)
5.	DTR1	- Com1- DTR or LAN connection (optional)
6.	RI1	- Com1- RI or LAN connection (optional)
7.	YELLOW	- Yellow traffic light control signal
8.	RED	- Red traffic light control signal
9.	GREEN	- Green traffic light control signal
10.	RXD1	- Com1 - RxD
11.	TXD1	- Com1 - TxD
12.	DCD2	- Com2 - DCD
13.	DSR2	- Com2 - DSR
14.	RXD2	- Com2 - RxD
15.	RTS2	- Com2 - RTS
16.	TXD2	- Com2 - TxD
17.	CTS2	- Com2 - CTS
18.	DTR2	- Com2 - DTR
19.	RI2	- Com2 - RI
20.	+5V DC	- RSC power indicator
21.	GND	- Ground
22.	GND	- Ground
23.	+24V DC	- Power to RSC
24.	+24V DC	- Power to RSC