

Client:
Toronto Transit
Commission

Location:
Toronto, ON, Canada



The TTC provides surface and subway mass transit for the entire Metro Toronto area. The subway system was established in 1954 and now includes 70 subway and LRT stations and over 730 vehicles. Coincident with the TTC purchase of 372 new T1 vehicles, Trak Com designed, manufactured, and implemented a new Subway Car Radio System (SCRS) that provides communications for the three main subway lines (Bloor-Danforth, Yonge-University-Spadina, and more recently Sheppard). Trak Com continues to provide 3rd level maintenance for the system including periodic field audits. The system, in revenue service since 1999, consists of the following components:

- **Train Communications Unit**

Each of the subway vehicles is equipped with a communications package, which consists of:

- Power Supply to provide regulated and isolated DC from the 36VDC low voltage car power system
- Public Address Amplifier, connected to the vehicle speakers for making onboard announcements
- UHF trunked mobile radio with MPT1327 signaling, for communications between trains and the mainline and yard radio systems ('A' car CCUs only)
- Operator Control Unit (OCU) used by the vehicle operators to log on and off, send and receive status messages, and make and receive intercom, radio, and PA calls.
- 900Mhz RFID tag, used to determine vehicle location with respect to fixed zones
- Interface to an onboard event logger (EVL)

Trains typically consist of 6 cars operated as three married pairs so the onboard communications package is interfaced to train lines which couple signals between the cars. A 32kHz ASK modem is used to exchange data messages between vehicles within the consist. This allows operators to make and receive train-wide calls from any car, and to pass logon information to all cars within the train.

- **Control Equipment**

The control equipment consists of interfaces to the SCRS radio channels, redundant processors, and a digital audio switch.

It manages all SCRS communications between trains and the transit control center (TCC). The radio control equipment is used to manage the messages between the mainline radio system and the trains. Signaling is accomplished via the dedicated control channel for each line, with voice channels assigned on a per call basis. One of the five voice channels is allocated as a fallback channel in the event of failure of the trunking system. The fallback channel is also used for emergency calls to enable trains to communicate with each other directly. In addition to the SCRS radio channels, the control equipment also manages communications via the station public address system and between the TCC and yards. Limited telephone communications via the SCRS control system allows direct communications between telephones and trains.

- **Dispatch Consoles**

PC-based consoles are used to provide an interface for TCC staff to the SCRS. They are connected via a LAN to the control equipment, with separate audio connections to the audio switching system.

- **Location System**

The location system consists of wayside RFID readers located at zone boundaries, which communicate with onboard RFID tags. The tags communicate the location information to the TCC via the radio whenever a train passes from one zone to the next, or when trains enter the yards

- **Yard Radio System**

When trains enter a yard, they are automatically switched to the yard voice channel. The Yard voice channel is used to provide conventional two-way radio communications between vehicles and yard dispatchers. Yards are also equipped with a separate yard data radio, which is connected to a host computer and used to download event logger information when trains are in the yard. To initiate an automated download, the Yard host signals a train via a short MPT message via the yard voice channel, which switches the train radio to the yard data channel. The yard host then interrogates the trains and retrieves data via 250 byte packets, using the 4800 BPS GMSK modem that is part of the onboard radio.

- **Portable Radios**

The system is further enhanced through the use of portable radios designed to operate within the SCRS trunked network and on other TTC conventional surface channels.
