

SGM Helps Keep São Paulo On the Rails



São Paulo, Brazil, is a sprawling metropolis of 20 million people, equal in size to Mexico City. With twenty million people in the urban area and five million cars, 11,000 official buses and 3,000 "pirate buses", the traffic congestion is the equal of anywhere in the world.

Like London, New York, and other large cities, São Paulo has its own subway system, although the city was a comparative late starter with its first line only commencing passenger service in 1972. Since then the subway operators, the **Companha do Metrôropolitano de São Paulo**, better known by its nickname, "Metrô", has added two more lines. Of late, with traffic pressures growing ever stronger, the Metrô has embarked upon an ambitious building program, adding new lines, additional stations, and upgrading all the original communications and control equipment, much of which was 25 years old.

SGM Telecomunicações [formerly Seicom] is an electronic equipment developer and system integrator that works almost exclusively with power utilities, police departments, and large corporations that need communications systems capable of wide area coverage. When Metrô asked for bids on the replacement of its aging communications consoles, the São Paulo-based SGM landed the contract with a winning bid that specified the use of 8 Zetron Model 4116B radio consoles and Zetron's new Model 4048 Common Controller.

Kazimierz Malachowski, SGM's Engineering Manager, explains his company's task: "The subway in São Paulo has three main lines that range in age from old to very old. The Metrô is expanding those lines and also renewing their electronics and communications systems. They had a very old communications system and needed to replace their radio consoles."

An enviable safety record:

Malachowski explains that Metrô communicates with its subway trains via a combination of VHF transmitters and a radiating cable system. All Metrô subway trains are equipped with a dashboard mounted VHF radio that is used to communicate with central control. Each train driver also carries a handheld, two-way radio on his belt. The handheld is on a different frequency and is normally used to communicate with maintenance crews. In an emergency, however, the train driver can use the handheld to communicate with central control. Under Metrô's stringent safety regulations, a train cannot leave a station without having radio communication with the control center. The radio system, when used in collaboration with ATOATC (Automatic Train Operation, Automatic Train Control) keeps the subway trains, which run with only a minute between them, out of each other's way. The system has proven very safe, and Metrô has never had an accident.

Redundancy a key feature:

Metrô is determined to keep its spotless safety record intact. To ensure this, the company insists on a high level of redundancy in all key aspects of train operation. This means that there are two operator positions for each of the three subway lines and two additional operator positions for maintenance.

"Because Metrô does not allow its trains to run without radio communication, we designed the system in such a way as to provide the greatest possible duplication of everything with the least possible downtime," Malachowski explains. "One of the main reasons I decided upon on the Model 4048 was the duplicated architecture. That was very important."

When configured with dual redundant system controllers and power supplies, Zetron's new Model 4048 Common Control Unit features an extraordinary

degree of reliability—no single point hardware failure will disable the entire system. The Model 4048 is specially designed to meet the needs of larger dispatch centers and is capable of controlling up to 48 radio or telephone channels and supports as many as 16 operating positions. The high reliability and larger channel capacity were the two main reasons SGM chose to bid the Metrô job with the Model 4048 Common Controller, which SGM is modifying to create even more redundancy.

“We are trying to set up the line cards in such a way that even the back panel is divided in two,” Malachowski says. “That way, if one back panel goes bad, they will not lose communication on our line.”

What the customer wants, the customer gets:

Metrô also had a number of special requests and requirements that literally had SGM burning the midnight oil. A complicating factor was that SGM could only perform the installation when the Metrô trains were not running, which meant they had to work between one and five o'clock in the morning.

Malachowski says that, during the first phase of the installation, the new equipment was run in parallel alongside the old equipment. A switch allowed Metrô operators to switch from one system to the other at any time. After a one month trial period, the old system was completely removed.

“In order to do this, we had to modify some of the features of the Model 4048,” Malachowski explains. “The radios the Metrô control center currently uses have a completely different guard tone. In order to be compatible, we had to change the guard tone of the Model 4048 to match the guard tone of the old radio system.”

Metrô also incorporated other custom features, such as a wireless headset with VOX control and an extra large footswitch for the operators. Both were required because each operator controls both the Model 4116B radio console and a train control console, and so had to be able to reach the PTT from any position.

A system as simple or advanced as needed:

The Metrô system was up and running by Mid-April, 1998, at which time eight model 4116Bs handling at least 31 radio channels were in place. SGM also provided training. Malachowski says that Metrô has asked SGM to keep the console operation as basic as possible, so as not to confuse the operators.

“It's very simple and straightforward,” Malachowski says, “because everything had to be compatible with the old consoles. They have no telephone on the system, only radio. What is different is that we have three different lines and each line is using different signaling. One is FSK, one is DTMF, and one is DC. Since we can't generate non-standard FSK from the Model 4048, we had to replace it with DTMF.”

Although many of the Model 4048's most advanced features won't be used, Malachowski says the ability of one console to take over operation of another console, or have one operator control two consoles will likely be used if needed.

Future growth:

Malachowski says that the Companhia do Metrôpolitano de São Paulo will be expanding and adding new lines to the subway system over the next few years. It's very probable, therefore, that even more Zetron hardware will be going under the streets of São Paulo in the near future.

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