

Signal Flow at the Met

by Greg Hanks

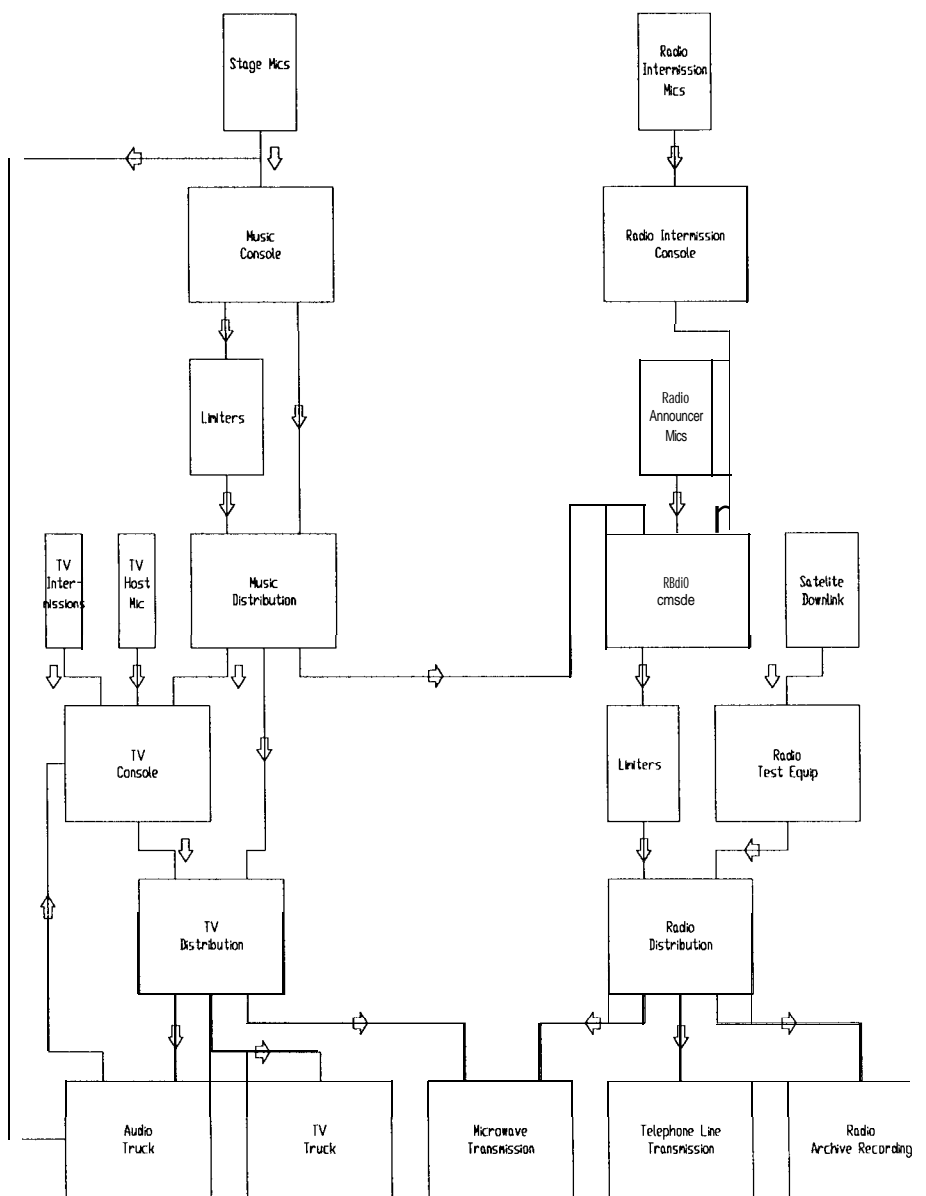
The newly renovated Metropolitan Opera venue provides a variety of live performance services. Very much in the style of "the old days," the Met offers facilities to accommodate live radio broadcast feeds to U.S. and European networks, video recording, live television, and live television with simultaneous radio feeds to the U.S. and Europe.

The sources include orchestra and stage mics, radio intermission mics, radio announcer, television host mics, U.S. and foreign television intermission feeds, and foreign network production coordination. The various program feeds are routed to destinations such as telephone line transmissions, radio archive recording, microwave transmissions to satellite, TV production

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control (inside the television truck), television remote truck (for audio and video record), the multitrack audio recording truck, and T-1 digital audio network feeds.

The house system must provide mic splitting, music mixing, limiting, distribution, switching, metering, monitoring, communication, television mixing, radio mixing, satellite reception and testing. Network source testing and loop-back verification, archive recording and intermission production services are also provided by the house. Whew!



Met Radio Function Diagram
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An environment of this sophistication is normally found only in a network broadcast facility. At the Met, it's spread out over five rooms in three different locations, all totaling less than 2,000 square feet! Each room is equipped for specialized system tasks. The first three rooms comprise the "radio booth," and are located on the Grand Tier in the back of the opera hall. For the last five years, New York Technical Support Ltd. has been instrumental in designing a grounding and shielding system for the Met, while performing the redesign and installation and wiring of the radio booth in conjunction with operations director Bill King.

The mix room contains the music console, the radio console and the music limiters and compressors, as well as all of the switching necessary to provide local metering and monitoring. The music console position has a direct line of sight to the stage. The radio announce booth is adjacent to the mix room, and for the purposes of simplification, is included in this category. Music distribution is provided at the music console for transformer-isolated +4 dBu feeds to the TV console, TV distribution and radio console.

The distribution room is used to feed audio for radio to the outside world, as well as provide the lion's share of the music distribution. The main distribution matrix provides switching of six input paths to 45 outputs at either +8 dB at 100- or 600-ohm output impedance or +4 dB at 100 ohms. These outputs are transformer-isolated, and the +8dB feeds are designed to be terminated. All of the +4 outputs are intended to provide their given level into a 600-ohm or greater bridging load. There are also a number of fixed, resistor-isolated outputs from the main output driver amplifiers that feed four different test signals throughout the complex. The satellite and microwavedownlink equipment is located in the distribution room, as are the prime interconnect patch facilities that tie all of the diverse locations together. The telephone line interface equipment, local database computer system, and video and system test equipment also reside here.

The record room provides radio archive in a number of formats, including analog 1/4-inch 15 ips, Dolby B cassette, PCM-1630, DAT, or EIAJ format to a PCM-FI processor (using 3/4-inch or 1/2-inch videotape). This room also contains isolation and distribution amplifiers for isolated and buffered feeds to and from distribution.

Local monitoring and metering are provided. Stage communication, telephone feeds, video intercom and interface logic are also provided.

Located in List Hall (down two stories, on the side of the main hall) is the radio intermission console and intermission production control room. The intermission microphones are located on the stage of List hall, and there is a logic system interconnect to the radio console for local and remote monitor muting and switch operation tallies. A I6-input Soundcraft console, various limiters, three 1/4-inch tape machines and other production equipment comprise the arsenal of gear.

B-3 houses the television audio distribution, television audio mixing, communications distribution and all of the microwave transmission equipment. This room is four floors down and a block away from the radio booth, and serves as an interconnect station between the television and audio trucks on the street and the Met. Super-compressed mono is sent from here to TV production, and both the TV host microphones and TV intermission audio are received and mixed here. The TV truck recorders receive mixed wide dynamic range audio. B-3 also receives a stereo mix from the audio truck in case of failure within the radio booth for live broadcast.

The audio system wiring spans 12 floors across a New York City block. This topology presents a significant wire length to the outputs of the driving devices, and the neutrals of the various electrical services do not necessarily have any relationship to each other. Balanced inputs and low-impedance (less than 100 ohms), transformer-balanced, floating outputs are utilized throughout. Local monitor switching, metering and patching are available at each location

Maintaining signal isolation, ground isolation and low crosstalk with a good signal-to-noise ratio is a challenge. Each of the rooms is internally grounded using a star method, and the mix and record rooms are brought together in the distribution room. All shields are telescoped from their respective outputs and dropped at all inputs. The only exception to this is within B-3, where one has the option of carrying the shield on the inputs and dropping it on the outputs to minimize conflict with any of the servicing audio and video remote facilities. Ground is to the building steel within the distribution room, as well as at B-3 and List Hall.

DL connectors form the primary interconnect. We utilized 26 96-point Bantam patch bays in the wiring of the distribution, mix and recording rooms. All bays interface with the rack via DLs, and the racks talk to the world through DL panels. These custom, single-rack-unit, shielded bays were provided by Audio Accessories with the top row multited to two DLs, mult normal'ed to the bottom row, with the shield not carried, and then brought out via another DL. The bottom row sources the shield via an internal bus brought out to a gold binding post that is brought to technical earth within each rack. A 12 x 2-inch copper bus bar was mounted in each rack, and each component was connected to it with #12 wire. All of the racks were then brought together within each room via a piece of #8 wire to the rack that contains the patch bays. Each room was brought back to the rack in distribution that contains the bays, and this rack was brought to building steel.

Technical power in the radio booth is a single phase of 120V from a Topaz 15 kVA power conditioner. Power comes in at 220-volt/3 phase and is converted to single-phase in the conditioner.

The net result of all this attention to detail is a dynamic range in excess of 90 dB, frequency response within 0.2 dB from 20 Hz to 20 kHz, and an improvement in the signal-to-noise ratio of approximately 15 dB compared to the previous system! ■

Greg Hanks has been building high-performance audio systems for 23 years, and now heads York Technical Support, providing installation, service and consulting to the audio industry.
