OPERATIONAL DESCRIPTION

NV8300E/V TRANSMITTER FAMILY

NV8601E/V 0.3-KILOWATT TRANSMITTER (OFDM)
NV8602E/V 0.6-KILOWATT TRANSMITTER (OFDM)
NV8603E/V 0.9-KILOWATT TRANSMITTER (OFDM)
NV8604E/V 1.2-KILOWATT TRANSMITTER (OFDM)
NV8605E/V 1.5-KILOWATT TRANSMITTER (OFDM)
NV8606E/V 1.8-KILOWATT TRANSMITTER (OFDM)

NV8300 Transmitter Operational Description/Functional Overview

Following is a brief operational/functional discussion of the NV8300 series transmitter. A much more detailed description may be found in the Exhibit *NV8306 System Manual* and in the Exhibits: *SV800 MediaFLO Exciter Instrument Manual , NetCCU 800 Instrument Manual* and *VH8300A1 Power Amplifier Instrument Manual*.

Overview:

For the sake of this discussion the NV8300 transmitter may be sub-divided into several parts. Electrically they are signal generation, signal amplification, passive output combining and spurious suppression. Mechanically is the forced air cooling system and the cabinetry.

Signal Generation:

The "heart" of the NV8300-series transmitter line is the SV800 exciter. Using state-of-the-art technology, the multiformat-capable SV800 exciter synthesises the desired RF output (carrier) frequency in either the VHF or UHF television bands. The operating frequency is selectable "in the field" at the time the unit is installed. The internal synthesiser references either an internal TXCO oscillator or an external reference input. In addition to the external frequency source it is also capable of accepting an external 1 pulse-per-second signal for synchronized operation in single-frequency networks.

The SV800 exciter accepts two appropriate transport streams, selecting either one with an internal switcher. The switcher may be configured to automatically switch to the alternate input should the transport stream on the active input fail. The exciter fully processes the incoming transport stream and modulates the carrier with that information in the appropriate output format.

The RF output from the exciter is "on carrier", requiring no external frequency conversion. The output level, a nominal +13-dBm for digital standards, is tightly controlled by an internal automatic-gain-control circuit resulting in a very stable RF output level. In addition, the exciter has available an optional group delay correction system that monitors the RF output of the transmitter, both after the final amplifier stages, and after the channel "mask" filter. The circuitry "pre-distorts" the exciter's RF output to compensate for non-linear distortions of the power amplifiers and the linear distortions of the channel "mask" filter. Both non-linear and linear corrections may be accomplished either manually, or automatically on a continuous basis, at the discretion of the end user.

Mechanically the exciter is comprised of four modules: the input interface, the Mainboard, the RF interface and the power supply. The four modules, and supporting hardware, are packaged in a single 1 rack-unit case.

Signal Amplification and Filtering:

The RF output of the exciter connects to a passive, electrically-operated coaxial transfer switch that is used to select between the main and alternate main exciters in the "V" version of the transmitter. The output of that switcher then connects to a passive, ten-output power divider. (In the case of the single exciter

"E" configurations the RF output will be connected directly to the power divider, omitting the switch). In the NV8306 the outputs of that power divider branch to feed the six VH8300A1 power amplifiers in the transmitter cabinet (Lower power transmitter models require fewer power amplifiers.)

Each power amplifier accepts an input of around 1-milliwatt and amplifies it to approximately 300-watts. The output of each amplifier feeds into a model-appropriate (having the correct number or inputs) passive power combiner to combine the power from all of the amplifiers into one output terminal. Optimum power combining is assured by precision machining of components in the output combiner and careful manufacturing of the cables that feed the amplifier inputs. Adjustments in level and phase are also possible for each individual power amplifier via the transmitter control system if such adjustments are required for optimum performance.

Each power amplifier is housed in a three rack-unit enclosure that slides into the transmitter cabinet from the front. All electrical connections are "made" when the unit is inserted fully into the self-aligning backplane of the cabinet. The airflow inlet and outlet for the crossflow cooling are also properly aligned when the amplifier is fully seated it its respective cabinet position.

The output of the power combiner is connected to a precision directional coupler through a low pass (harmonics) filter and then to an output connector. The precision directional coupler is used for measuring transmitter power, both forward and incidental, and to provide sample points for various functions such as the non-linear equalizer and customer specific applications. It also contains a lightning protection device of proprietary design.

Transmitter Control System:

Central to the control of the transmitter is the NetCCU 800. This device coordinates communications between all of the various components in the transmitter and the outside world. Full monitoring and control is available via the unit's front panel color LCD display and its front panel keypad. Password-protected control is also available via a WEB browser interface from the front panel Ethernet connector while its in "Local" mode and at its rear panel Ethernet connector when its not in "Local" mode. WEB browser based monitoring capability is always available at both ports. In addition a optional SNMP server program is available for customized IP based monitoring and control.

At the highest level "ON" and "OFF" control and forward and reflected power readings are available, and all that are required to operate and monitor the transmitter. At deeper, password-protected levels, both monitoring and control is possible down to the individual transistor level in the power amplifiers and exciters.

Communication between the NetCCU 800 and the one or two exciters in the system is via TCP/IP connection. For control and monitoring of the power amplifiers, coolant pump system and heat exchanger a CAN bus is utilized via a "rack controller". The afore described exciter switcher is controlled directly from the NetCCU 800. An optional parallel interface is also available to allow connection to "legacy" remote control systems.

Transmitter Power Distribution:

The NV8300 series of transmitters has an AC power distribution system located at the bottom of the transmitter cabinet. Either 208 to 240-volts single-phase AC

power or 400/231-volt three-phase AC power, depending on the configuration at the time of order placement, is brought in to the transmitter through a master disconnect switch located on the left side of the power distribution panel. From this disconnect switch the power branches out to up to six motor-controller type circuit protectors that, in turn, feed up to six power amplifiers to provide individual circuit protection and disconnect capability. Power is also routed to standard single-phase circuit breakers that provide protection and disconnect capability for the subsystems in the transmitter such as the exciters, the NetCCU, and the dual blowers for cooling of the amplifiers. The power distribution is designed such that when the electrical distribution's front panel in in place there are no exposed power conductors anywhere in the transmitter. That front panel cannot practically be removed without opening the master disconnect switch.

Transmitter Cooling:

The NV8300-series transmitters are cooled with forced air, supplied either from the room in which the transmitter is installed, or from a more distant source via external ductwork. The outlet air can likewise either be exhausted to the room or to a more distant terminus. Two separate blowers are utilized with internal dampers situated such that in the event of a failure either blower can be replace without shutting down the transmitter. The internal air distribution plenum on the blower side provides the greatest airflow restriction at the amplifier inlets, thus allowing for an amplifier to be removed with no reduction in cooling to the other amplifiers in the transmitter.

Transmitter Cabinetry:

Each model of the NV8300-series transmitter is housed in a single, robust cabinet constructed of steel. The cabinet is only slightly larger than a standard equipment rack. The transmitter is totally self-contained within that single rack.